IMPERIAL

DEPARTMENT OF AGRICULTURE

FOR THE WEST INDIES

REPORT

ON THE

AGRICULTURAL DEPARTMENT

DOMINICA.

1927-28.

TRINIDAD.

ISSUED BY THE IMPERIAL COMMISSIONER OF AGRICULTURE,

IMPERIAL COLLEGE OF AGRICULTURE.

1929.

[Price Sixpence.]

PRINTED AT THE BULLETIN OFFICE, ROSEAU, DOMINICA, B.W.I.

REPORTS

ON THE

BOTANIC STATION ECONOMIC PLOTS

AND AGRICULTURAL EDUCATION,

DOMINICA.

Annual Reports on Certain Economic Experiments conducted in connection with the Botanic Station, 1900-2.

Annual Reports on the Botanic Station for the years 1901 and 1902.

Annual Reports on the Botanic Station, Economic Experiments, and Agricultural Education for the years 1902-3 to 1921-22.

Report on "Lime Varieties in Dominica" by F. G. Harcourt, Agricultural Superintendent.

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LETTER OF TRANSMITTAL.

C.A. 620.

TRINIDAD.
27th December, 1928.

SIR,

I have the honour to transmit herewith the Report on the working of the Dominica Agricultural Department for the year ended March 31st, 1928.

(2) The Report indicates that the routine work of the Department has been carried on throughout the year. In addition to the normal work of the Agricultural Department a very considerable amount of time and energy appear to be required by the officers of the Department in connection with the Loan Board and other outside interests.

(3) The report on the working of the Peasants Information Bureau is included, and this indicates that very satisfactory progress has been made along the lines of activity for which the Bureau was created.

(4) The losses due to red root disease have continued during the year under review, and the exports of lime products show a falling off equivalent to a shortage of some 4,000 barrels of limes. A very large part of this reduction is attributed to the effects of the red root disease. In this connection the report of Dr. Briton-Jones on this subject is included in this Report.

(5) The section on lime varieties gives an account of the continued work in the effort to find a satisfactory lime fruit immune to wither-tip. The varieties reported on previously have been under observation, and it is stated that while the amount of fruit so far obtained from these plants is too small for a definite opinion to be expressed, it appears to be likely that one or more of them will prove of value in lime cultivations. Among other introductions the Indian lime the "Kagzi nimbu" may be mentioned.

(6) The notes on Dominica citrus fruits which were exhibited and offered for sale in the United Kingdom indicate that a market may be found for grapefruit and oranges from Dominica.

(7) The samples of tobacco submitted to the Imperial Institute were not favourably reported on. If tobacco is to be grown successfully in Dominica, careful manurial experiments will be required in order to determine whether leaf of good quality can be produced in that island.

I have the honour to be,

Sir,

Your most obedient servant,

H. A. BALLOU,
Commissioner of Agriculture,
Imperial College of Tropical Agriculture.

His Honour,
The Administrator,
DOMINICA.

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STAFF OF THE AGRICULTURAL DEPARTMENT, DOMINICA.

F. G. HARCOURT, F.R.H.S.	Agricultural Superintendent and Curator of the Botanic Gardens and Experiment Station.
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J. C. BRUNEY	Travelling Agricultural Instructor.
A. C. WINSTON	Travelling Agricultural Instructor.
F. J. BAPTISTE	Foreman.
*J. J. MCDOWELL	Plant Inspector.
C. ALEXANDER	Overseer.
*L. OSCAR	Overseer.

* Temporary appointments.

REPORT ON THE AGRICULTURAL DEPARTMENT, DOMINICA.

FOR THE YEAR ENDED MARCH 31, 1928.

WORK IN THE GARDENS AND OBSERVATIONS ON PLANTS.

THE Botanic Gardens were maintained in good order throughout the year.

The absence of a dry season precluded the necessity of watering, and prevented the Gardens presenting that parched appearance usual during the dry season; however, despite these advantages, a period of rest is generally beneficial to the Gardens.

The need of economy, and the more urgent Agricultural work now performed by the officers of the Department, have prevented much needed improvements which call for expert supervision being put into effect.

The flowering for the first time of the "Marang" (*Artocarpus Odoratissimus*) has to be recorded. Two plants of this species which is closely related to the Breadfruit Tree were received from the United States Agricultural Department in February, 1922, and were planted out the following year. One plant succumbed, but the other, planted in a damp and sheltered situation, is doing well and has attained the height of thirty feet. A third plant was received during 1925 and has now attained a height of 10 feet.

For the purpose of keeping together the Hydnocarpus collection 5 Tangerine trees were cut out, and 5 plants of *Hydnocarpus Wightiana* raised from seed received the previous year were planted. A further permanent planting of this valuable tree was also made on the site of the Old Vanilla plot. The Vanilla had been removed as the plot was practically worn out, and Vanilla cuttings being generally obtainable from outside sources, its utility as a nursery supply had ceased.

The Hydnocarpus collection is doing well and is being carefully attended to.

The Cricket Pitch situated on the Main Lawn was repaired and top dressed.

The Gardens have made a rapid recovery from the effects of the hurricane recorded in the last Report, and future permanent plantings will be governed by the choice of those trees offering the best resistance to hurricane winds.

A great improvement to the town's appearance has resulted from the Government's decision to convert a piece of rough land adjoining the Fort and sea front into a Public Garden. The Department has commenced to clear the land, which will be grassed over and planted with suitable trees and shrubs.

WORK IN THE NURSERIES AND DISTRIBUTION OF PLANTS.

A brief review of the conditions leading up to the decision to distribute plants free to the peasantry may be in place.

It should be pointed out that the Department's nurseries from the principal source of supply of planting material for planters and peasant proprietors, and that the average number of plants distributed during the four years subsequent to the appearance of withertip only amounted to 10,000 plants.

As the acreage of profitable lime cultivation after withertip was probably reduced by 40-50 per cent it was evident that big efforts on the part of the planters and Government were necessary to arrest the agricultural decline.

It was soon realised that the difficulties attendant on the direct financing of loans to peasants by the Loan Board were such as to render this possible in only a few cases. Representations were made to obtain money from the Imperial Loan by way of a grant in order to finance a free distribution scheme and instructions were issued to the Agricultural Department on the 13th January, 1927, to advertise the free issue of seedling plants from the Department's nurseries. It must be noted, however, that the Department had previously, so far as its funds allowed, been distributing plants free of charge to deserving cases. The immediate result was that the Department's supply of plants, sufficient to meet the previous demand, was speedily exhausted, and measures were at once set on foot to:—(a) furnish an adequate supply, (b) to organise a planting campaign amongst the

peasantry and (c) to ensure a future care of the plants.

Coconut nurseries were established at Geneva, Marigot, Vieille Case, Castle Bruce, Rosalie and Portsmouth. Further additional land was secured within reach of the Department's Headquarters in Roseau. Propaganda work has been persistently carried out by all the officers of the Department, who have given lectures in all parts of the Island. The co-operation of the clergy was secured, the campaign was broadcasted from all the churches. The services of an officer was devoted entirely to this work and the frequent issue of suitably worded posters have effectively brought home to the peasants the objects and advantages of the scheme.

The Department has for some time past been in a position to meet the demand for seedling plants i.e., Coconuts, Cocoa, Nutmegs and Coffee.

The essential need, at the present time, is for budded plants, and the Department is sparing no effort to cope with the situation. Not only is the fruit trade dependent on this class of plant, but the extinction or preservation of the lime industry depends on the speed by which the seedling lime now rapidly succumbing to the ravages of root disease can be replaced by the budded article.

Budded plants, which are supplied at a greatly reduced rate are not easily propagated, and have occasioned some concern as they take from eighteen months to two years to produce.

Eighteen months ago the limited demand for budded plants was easily met and the necessary quantity of Sour Orange stocks grown to meet any ordinary demand Following my address on "Lime Varieties in Dominica" thousands of budded plants of these varieties were ordered. About the same time, the realisation of the possibilities of an overseas trade in grapefruit and oranges caused a demand for these plants. A few months later, Red Root disease commenced to play havoc with lime cultivations damaged by the severe storm in July, 1926. It has now reached such proportions that it is imperative that areas so affected be planted up with budded limes on the sour orange stock, which is highly resistant to root disease. The reasons here mentioned led to a big demand for budded plants, and the Department had to use every effort to meet it. Existing stocks of budded plants were soon cleared. The chief difficulty presenting itself was the shortage of Sour Orange stock for budding purposes. Seeds were sown as soon as procurable and we have now many thousands of young stocks which will shortly be ready for budding. The gravity of the position was soon realised by several leading planters who are now running nurseries of their own, and consequently will relieve the pressure on the Department in coping with the situation.

On the recommendation of the Mycologist, Dr. Briton-Jones of the Imperial Department of Agriculture, the Department has now stopped the distribution of seedling limes.

The number of pupils taken by the Department has been increased and they are being trained in the art of budding and grafting.

Some people have expressed dissatisfaction at the Department for charging so much as 3d. for a budded plant and have refused to pay after delivery. I would point out that it costs from 2/6 to 3/- to raise a budded plant of a standard acceptable by serious fruit growers It is only consideration for the peasant proprietors that makes me hesitate recommending that budded plants be supplied at cost and not at the ridiculously low price of 3d. per plant.

Other economic plants such as Coconuts, Cocoa, Nutmeg and Coffee are much more easily propagated and the Department is now in a position to meet any local demand. There is a steady demand for these plants with the exception of Coconuts, in which instance the demand has considerably fallen off and difficulty is experienced in getting people to take them. This is not surprising as peasant proprietors have not the area of land in their possession to warrant the general planting of this or any one crop, and in many cases their land is unsuitable for Coconuts, being at too high an altitude.

The varying conditions of climate and soil encountered at various altitudes necessitates careful crop selection, and growers readily consult the Department on this matter.

Planters, who obviously were not in a position to pay for plants, have also been assisted by being given plants free of charge.

The following is a list of plants issued free or at a reduced rate, since the Free Plant Distribution Scheme came into operation on the 12th January, 1927 :—

Plants.	*Total to 31.8.28.*
Washington Navel Orange	1,720
Grapefruit	2,521
Portugal Orange	68
Mandarin	33
Sweet Lime	29
Tangerine	47
Limes (Seedlings)	39,917
Limes (Budded)	865
Limes (Other varieties)	2,931
Budded Lemon	569
Coconut	14,939
Cocoa	14,057
Coffee	48,444
Grafted Mangoes	363
Nutmegs	6,277
Papaw	1,910
Tobacco	6,282
Mangosteen	281
Tannias	6,989
Camphor	363
Mango Seedlings	74
Sour Orange Stocks	1,975
Guava	22
Black Pepper Cuttings	494
Onion Plants	13,600
Gliricidia	336
Miscellaneous Cuttings	3,557
Miscellaneous Plants	2,475
Total	171,138

PLANT IMPORTATIONS.

Plant introductions made during the year were as follows :—

Musa sp. F.H.B. 69058., *Mucuna utilis, Aleurites Fordii., Cassia sp.. Prunus Hy., Poinciana sp.,* Peach Almond Cross., *Pimenta acris., Saraca triandra., Saraca Griffithiana., Crataeva Sophosperma., Hedychium Moorei., Swietenia macrophylla., Cedrela mexicana., Pinus Caribæa., Ochroma bicolor., Schizolobium paraphytum., Sweetia panamensis., Bucida Buceros., Coffea,* variety San Ramon., *Grevillea robusta., Eucalyptus sp., Juniperus oxycedrus., Juniperus phœnicea., Palaquium gutta., Bassia malaccensis.*

WORK CONNECTED WITH INSECT AND FUNGUS PESTS AND THEIR CONTROL.

In last year's Report reference was made to a widespread outbreak of root disease in the Lime Cultivations.

The services of the Mycologist from the Imperial College of Tropical Agriculture were immediately requested by the local Government. Dr. Briton-Jones, Ph.D., D.I.C., etc., visited Dominica in August, his report being as follows :—

"I arrived in Dominica on the 25th July and remained there until the 4th August. I was not able to see more of Dominica than those estates which lie around Roseau. This was due to the fact that I had much detailed examination of diseased material to make, and secondly because during the whole of my tour and until my return to Trinidad, my state of health was such, that very long drives or walks through plantations were often impossible. In spite of this, however, I was able with the whole-hearted co-operation of the Agricultural Superintendent and all his staff to make some interesting observations concerning the so-called Red Root Disease.

Before leaving Dominica I addressed for an hour and a half a public meeting at the Court House.

In view of the recent findings of Dr. Small, Mycologist, in Ceylon, it became necessary to make an investigation *de novo* of the outbreak of root disease in Limes. For this purpose I took with me a microscope and several tubes containing sterile media for culture work. The whole question is so complex that I consider it best in the first place to review the position in regard to all root diseases of limes in the West Indies, as they were accepted up to the time Dr. Small published the results of his investigations in connection with Root diseases in general as found in the East.

Rosellinia diseases. Two species of Rosellinia, namely *R. pepo* and *R. bunodes* have been described as causing root-rot in Lime Trees and other plants in the West Indies. In the laboratory at the Agricultural Department I was shown a specimen of lime root with the white fans of mycelium which are so characteristic of *R. pepo.* A portion of a root which I collected myself and incubated in the laboratory developed on its surface the conidal fructifications of Rosellinia. The white fans of mycelium were also developed which showed that they both belonged to the species *R. pepo.* It is interesting to note that the section of the small root alluded to above was obtained from a root system, the larger roots of which showed the rhizomorphs of *Sphaerostilbe sp.*

Sphaerostilbe repens. Mr. Ashby has informed me in a letter that the species of Sphaerostilbe on limes in the West Indies is considered to be *Sphaerostilbe repens.* This species has been known in the Eastern Tropics for many years.

All my observations in Dominica have led me to the definite conclusion that it is not the primary cause of the disease.

Collar Canker. The description* of this disease is vague and I noted that in one of the Annual Reports of the Agricultural Department of Dominica that it was considered at one time to be the same as foot-rot or Mal-di-Goma. In any case I found no trace of Collar Canker as a specific disease.

Gummosis. There are several diseases of citrus trees which come under this heading, but the symptoms of some of the cases found in Dominica resembled one of two, viz., *Phythiacystis citrophthora* or *Phytophthora parasitica.* Nowell in his book already alluded to, states that apparent instances of Foot-rot or Mal-di-Goma (*Pythiacystis citrophthora*) have been met with on Lime in St. Lucia, Dominica, and Grenada. The symptoms of these two diseases are so similar that I would not personally attempt to diagnose the one from the other without isolating the organism. Furthermore, a plant was examined which showed the primary stage of a Gummosis which might be taken for one of the above. Isolations, however, yielded a third and significant fungus in culture. The extent of the trouble caused by one or more forms of Gummosis in the epidemic in Dominica was one of several technically important points which I could not possibly solve in my ten days visit. To explain them all would require many months of hard work.

So far as previous records in the West Indies go then, I found double and single infections of the fungi *Sphaerosti be repens* and *Rosellinia pepo.* It is interesting to note in connection with Rosellinia that Cacao and Breadfruit trees were found in many cases surrounded by dead Lime trees. Symptoms or rhizomorphs of *S repens* were found in all the root systems examined both in the field and the laboratory with the exception of one plant. A deliberate search was made for this plant, because it was highly desirable to obtain a specimen which showed the primary stage of disease. The symptoms as shown by the defoliation and death of one branch of the tree was similar to what has previously been considered to be due to Red Root (*S. repens*). For a distance of about a foot above ground level, however, there was a copious exudation of gum from the trunk. The plant was uprooted carefully and taken to the laboratory for further examination. Only one main root was diseased and that only on its upper half and on the portion near the crown. This is another point of similarity between this and Red-Root. The diseased branch was sawn off just above the fork where the main trunk gave rise to three branches. This was about ten inches above the ground. The wood on one almost complete half of the branch corresponding to the diseased area on the root was grey in colour. The other half was normal. The cut end was pared with a knife, swabbed over with alcohol and flamed. Small portions of the innermost diseased region of the wood were then transferred to culture medium. Three cultures only were made, because there were not many tubes left. Two of these became hopelessly contaminated with common air-borne weeds (e.g., *Aspergillus flavus*), bacteria, etc. The third was also somewhat contaminated, but not to anything like the same ex-

*Nowell, W. "Diseases of Crop-Plants in the Lesser Antilles."

tent. The main growth developed was *Macrophomina phaseoli*. It has already been stated that the root was only diseased near the crown, the remainder of the whole root system including the finer roots being normal in appearance and with no trace of any fungus infection. This agrees in the main with Dr. Small, who states that *M. phaseoli* is the forerunner of all the fungi which have previously been found associated with Root disease in the East. The young tree in question had been planted on a mound which was above the general level of the ground. The soil below the surface was exceptionally dry and the roots had grown down almost perpendicularly for a distance of two feet or so after planting. (Vide also under predisposing factors).

Dr. Small in his publications has stated that root disease will undoubtedly occur everywhere where the fungus *M. phaseoli* is present in the soil. In an article in "Tropical Agriculture" (August, 1927) I have contended this point on the grounds of failure of infection experiments on cotton carried out by Dr. Butler in India. I have also carried out infection experiments on Cotton in Egypt, and on both Cotton and Jute in Trinidad, where the fungus has recently been found associated with a root-rot of cotton. It is known elsewhere on Jute. In each case the fungus although placed at the root of cotton in pure culture and in quantity has failed to produce the disease. It follows then that there must be some predisposing factor or factors before infection is possible by the fungus.

Before discussing these several factors which have contributed to the epidemic in Dominica it may be noted that on several of the diseased roots examined there was found a mycelium growing on the bark which agreed with descriptions of *Fomes Lignosus*. It is not possible, however, to identify this white mycelium from many others. Dead stumps and trunks of Lime trees left lying about on the ground after the trees have died, have invariably been found to develop the fruiting bodies of *Fomes Lignosus*. They have also many times been observed on the dead halves of branches still on the trees. Thus there is here as much evidence for the parasitism of *F. Lignosus* as is given by Petch*. This fungus is also recorded as a parasite of Cocoa. It is extremely common on felled Castillia rubber trees in Cacao plantations in Trinidad, and although close watch has been kept on it for a year or more in certain sections, no sign of the spread to Cacao has been observed. I do not at present eliminate it entirely as a possible factor, but my observations strongly support those of Dr Small. It is not a primary parasite, and if it contributes at all towards the killing of the plant it is in the capacity of a very weak parasite. It is of no consequence whatsoever from the practical standpoint.

Predisposing Factors to Root Disease in Dominica. None of the aforementioned fungi with the exception of *Pythiacystis citrophthora* and *Phytophthora parasitica* can be considered primary parasites. Whether or not one or both the above were present in Dominica has not been determined, but nevertheless, it is a well known fact that the damage caused by both can be satisfactorily controlled by reducing the moisture round the crowns of the trees, if done in time. In the one case of gumming examined in the primary stages the fungus isolated was *Macrophomina phaseoli*, but how widely spread this fungus is I was not able to decide in the time.

The disease or diseases were found in the valleys and on the hillsides; on well drained and badly drained land. It should be pointed out, however, that lime trees growing on a slope are not necessarily in well-drained soil.

Floods. In the past it has been stated that the incidence of the disease suggests its origin from the forests, and in new clearings that infection has been directly transferred from logs or the roots of stumps: in older cultivations from infested material brought down by floods. For control a system of isolation trenches linked up with an effective drainage system has been recommended. I agree with this so far as the drainage for the purpose of reducing soil moisture is concerned, but I think the measure of isolation unnecessary. It would be better to accept the universal distribution of the fungi in the soil. Effectively to cut down the source of infection in a case of this kind is extremely difficult if not impossible in Dominica. In any case it cannot be entertained as an economic measure under existing economic conditions. Flood water similarly is not important because it brings down infested material, but because of the soil and other debris which settles in the plantations and covers that portion of the base of the tree which was previously uncovered. This, in itself, weakens the trees very considerably. Even in the absence of parasitic or semi-parasitic fungi, it is likely that rotting of the bark would take place. The presence

* Petch, T. "Diseases and Pests of the Rubber Tree."

of various weakly parasitic fungi like *M. phaseoli* and *S. repens*, however, adds to the damage. Fundamentally these fungi are not important, but as a secondary factor they are of considerable importance. From a practical point of view, therefore, by far the most economic and indeed the only really efficacious control measures must aim at the removal of the fundamental causes. In the case of flood, efficient drainage to free the land of excessive soil moisture as soon as possible coupled with the freeing of the crown and the bases of the main roots of soil is all that is necessary. Flood water, however, is not a universal factor and the predisposing causes vary in different localities. The last flood was in October, 1924, but it must be remembered that the result of silting up of the crowns is accumulative in its action. In the dry season it will be checked and will again progress during the next rainy season.

Hurricane. In July, 1926, Dominica experienced a somewhat severe hurricane which blew down many lime trees and wrenched a good many others. The check due to transplanting is well known and a wrenching of the trees by wind is similar in that it destroys a large percentage of the finer feeding rootlets. It is also more serious in the case of adult trees.

Wither-Tip Disease. Withertip disease is so bad in some localities that it causes a great deal of defoliation. It also checks new growth by killing back the young twigs. It is thought that Withertip alone in some cases causes the death of Lime trees. I can accept this, but the effects of abondoning the field following the advent of bad attacks of Withertip would possibly kill them or render them susceptible to the action of weak parasitic fungi. The fields have in many cases been allowed to run to bush including mistletoe, which chokes up and kills the branches. Indeed, mistletoe is far too common in fields which are now said to be cultivated.

Die-back. The dying back of branches is a disease which is often found in places where conditions of soil are not altogether suitable for limes. It can also occur on good soil which is subject to the effects of drought. Furthermore it follows Withertip and the factor already mentioned under that heading. Die-back is itself a manifestation of weakness so that more serious trouble following is only what can be expected. There were signs that this trouble had been of long standing on several of the estates.

Weeds. It is no exaggeration to say that a good many of the plantations are weeded once a year and just sufficiently well so that the ripe and fallen limes can be collected. These weeds, apart from any other serious effects on lime trees, retain moisture and cloak in the crowns of the trees so that they are kept wet for long periods at a time. The effect of this is somewhat similar to that of the soil brought down by flood water.

Pruning. This is a horticultural operation known to only a few in Dominica. The lime does not form callus readily and for this reason it is advisable in removing a branch to take more than ordinary care. After sawing off close to the butt it should be pared carefully with a knife and painted with a fungicide like Carbolineum or Solignum. These are better than Bordeaux mixture, because they can always be kept in stock and ready for use. They are also taken up by the wood and so their effects lasts longer, particularly in Dominica where the rainfall is high. In the majority of the Lime fields examined the larger limb had been hacked off and the jagged ends sometimes a foot or more in length were left. The result is a dying back of the branch not only to the base, but continued to the trunk, along the same side as the branch was removed, right down to and below the ground. The extent to which the trunk is affected can be roughly guaged by the cracks in the bark on each side of the dead region. This weakens and often kills the root feeding that side of the tree. Such a root is then a seat of infection for root-rotting fungi. In conclusion it is doubtful whether the removal of large limbs is necessary except on rare occasions if the lime trees are well looked after.

Close Planting. All the commercial lime fields examined are far too closely planted. The trees in some cases are forty or fifty years old, and are planted ten or fifteen feet apart. Indeed, fields are now being cultivated which were originally planted as shade for Coffee many years ago. Further, the edges of these fields are protected by windbreaks of lime trees grown as hedges and planted three feet apart. Under such conditions cultivation is not possible and the weeds take charge. Even fields planted during the last five years have been planted at distances ranging from twelve to twenty feet apart. This practice is sometimes advocated because it is considered desirable to form a canopy as

quickly as possible to keep down weeds, and so that the lime tree can prune itself. It is also said to reduce the cost of maintenance.

The more modern view is that citrus orchards should never be covered in. There are several very sound horticultural and pathological reasons why sun and air should be allowed through a citrus orchard. The shade created by seedling lime trees as grown in the West Indies, is never sufficiently dense materially to influence the growth of weeds. Weeds can grow luxuriantly in all but the difference between open spacing and close planting is that in the former weeds can be kept down by green cover crops, which can later be cut down and used as mulch, whereas in the latter it is almost impossible to keep down weeds owing to the low and interlocking branches. It is also very significant that the net profit on the limes as grown in the Agricultural Department surpasses by more than a hundred per cent that on the majority of the lime estates. This in spite of the fact that the soil is not so good as on some of the other estates. It is impossible to discuss the question of the self-pruning of lime trees without knowing what the object is supposed to be.

Before leaving the subject of too close planting I, after visiting all the Islands where the West Indian Lime is grown, would like to state that it is a great pity that spraying of lime trees against the Withertip disease was ever recommended. Much money would have been saved if it had been stated from the very first that no direct action could be taken against "Withertip" under West Indian conditions. This conclusion must have been obvious from the very beginning.

Artificial Fertilisers. On many of the estates Sulphate of Ammonia had been used exclusively as manure for lime trees for several years in the past. The disastrous effect of such a practice is well known. Not only does it make the soil acid, but the plant will on a good many soils suffer from potash deficiency. Acid soil favours the growth of fungi and inhibits the growth of beneficial soil bacteria. The question of lime requirement of the soils of Dominica is a matter which might quite profitably be inquired into. Liming of the land was advised by me because it flocula!es clay, renders the soil less acid, and accelerates the breaking down of humus By floculating clay it makes drainage and cultivation more effective from a pathological point of view. For the same reason the breaking down of humus and reduction of a soil acidity makes the soil a less favourable medium for fungi.

Insect Grubs It will be noted that not one of the factors so far dealt with can be supplied to all the estates inspected. It is clear, however, that one, and sometimes more than one, plays its part as a predisposing factor to root diseases in the different localities On the other hand there was one factor and only one which was present on all the several root systems examined. This was the damage caused by the insect grubs. I was unable to identify the grub and only one was found. This was about ¾ inch in length, almost white in colour and the dark coloured contents of the alimentary canal were visible through the semi-transparent body. The body was somewhat bent dorsoventrally, and swollen at the higher end. The grub had three pairs of legs.

The damage caused was considerable in some cases and in all cases the cortex had been eaten away as far as the wood. The grub eats its way along the root for varying distances up to a foot or more, sometimes more or less in a straight line and at others in a curved and twisted manner from one side of the root to another. At the edges of the groove callus is formed sometimes to close the wound completely in slight cases. In others the callus is confined to the edges of the groove and the wood is exposed. If no further complications set in it turns black. Observations showed that the fungus *S. repens* had gained entrance through a good many of these wounds. Whether *S. repens* was preceeded by *M. phaseoli* could not be determined. These grubs eat the cortical tissues of roots of all ages, except the very fine ones and regularly attack just under the crown. I consider the damage caused by these grubs of great importance since it was the only constant factor on all the diseased plants examined in the valleys and on the hillsides. It is interesting to note that some healthy young trees of seedling limes, as well as those on Rough Lemon and Sour Orange were also attacked. In spite of the fact that Sour Orange roots are attacked not a single case of root disease was observed wherever limes or other citrus fruits like Grapefruit and Washington Navel Orange had been worked on this stock. This is an entomological problem which calls for thorough investigation in connection with root disease of limes just as there are several mycological points which need further study before the relative importance of the many factors involved are thoroughly understood.

I am informed by Professor Ballou that three insect grubs have been previously recorded on Limes in the West Indies, viz., Diaprepes, Exopthhalmus, and Lachnosterna.

Control. The action which is necessary to take to control the present outbreak and to avoid repetition of a similar disaster in future is discussed under two headings, viz., Palliative Measures and Cure. All planters, however, should make a cure their ultimate aim. The time that it will take to effect this on the lines described below must of necessity depend upon the financial stability of those whom it concerns.

Palliative Measures. In the first instance the fields should be cutlassed and the weeds kept down to some extent by repeating this at least three times a year. The first brushing is necessary before any other serious work can be contemplated. When this is done the lower branches of all the trees should be removed, and if any large limbs are cut off the ends should be pared off in the proper manner and painted with Carbolineum, Solignum or Brunolinum. This in addition to allowing the free passage of a drying current of air through the plantation will enable labourers to approach the bases of the tree trunks. The soil should be removed from around the main roots and then carefully inspected by a responsible person. The object of this is to decide whether the disease is so far advanced that the tree cannot or is not worth saving. If far advanced it is not advisable to waste time and labour by attempting to save it. It is far better and more economic in the long run to dig it out and remove it. The hole so made should then be limed heavily, and if there are no other difficulties (vide below) another lime tree can be planted almost at once provided it is budded on Sour Orange stock. If only one root is affected the treatment of this also depends on the extent of the disease. Should it be advanced, cut off the root at the base, dig out and treat the cut end as in the case of branches If only partially affected, remove the dead bark and cut cleanly with a knife the healthy bark to a distance of half an inch or so beyond the diseased edge. Paint the exposed wood with any of the already mentioned fungicides. Earth up again to within a distance of six or twelve inches according to the age of the tree. This will leave a cup for rain water, but a small drain can easily be dug to connect with the main drainage system. Unless a drainage system is already in existence an efficient one can be dug. Some of the planters who were advised to drain their land as a measure against Root disease have done more harm than good. The soil removed in trenching has been piled round the trees in mounds, thereby forming a soil watershed or cup which drains towards the trunk instead of away from it. Heavy dressings of lime would also prove extremely beneficial on many lands, but the advice of a soil chemist should be obtained in this connection.

Cure. In a word the cure for root disease is to replace the seedling limes by those on Sour Orange stock. Financial difficulties have, of course, to be taken into consideration, but I understand that the Agricultural Department is prepared for the present, at any rate, to provide West Indian lime plants worked on Sour Orange stock at the extremely low price of 6^c (threepence) a piece. The replanting can be done by degrees if necessary, but all effort should be made to accomplish this as soon as possible. There are other matters for consideration and these are dealt with below. Some of the advantages of the West Indian lime on Sour Orange over the seedling lime tree are the following.

(I) *Deep rooting.* The sour orange is a deeper rooting system and will therefore be able to withstand hurricanes far better, than the shallower rooting system of the West Indian lime on its own roots. Furthermore, the ground between the trees can be dug deeper and with less damage to the root system.

(II) *Resistance to moisture conditions.* Being a deeper and altogether stronger root system it can naturally withstand conditions of drought better. It can also withstand conditions of excessive soil moisture better than seedling limes.

(III) *Resistance to Disease.* The Sour Orange has been proved for many years to be the most resistance stock to all diseases affecting the roots of citrus trees everywhere where citrus is grown.

(IV) *Heavier crops.* As can be seen by reference to this year's Annual Report of the Agricultural Department, the yields of limes on Sour Orange is greater than those of seedling limes in the absence of disease and growing under otherwise similar conditions.

(V) *Effect on Weeds.* The growth above ground is far more luxuriant than in the case of seedlings and the shade is dense enough to keep down weeds very effectively, with the minimum of attention. I hasten to add, however, that this should not be used erroneously as an excuse for close planting. The distance of planting on good land should be thirty feet and planted on the square.

New Plantations. The rudiments of modern horticulture should be observed in planting a new orchard. Lime fields as known at present should be relegated to the archives of history, and in future every effort should be made to produce limes in orchards. The two terms have an entirely different meaning.

Much could be written about citrus culture, but the following points are mentioned for the benefit of planters in Dominica.

The land should be cleared of bush by cutlass, and this should then be turned into the soil. The question of liming could then be considered. A leguminous crop like Bengal Beans or Tephrosia should then be sown. This will clean up the land, and can be turned in as humus to improve the fertility of the soil. The land should then be drained efficiently and the advantages or not of round digging of the beds considered, depending on the locality. The young trees on Sour Orange stock should then be planted carefully on the square, and any interference with the drains being avoided. The interval of planting on the best lands should be 30 feet square, but this is to a great extent a matter of judgment. Above all too close planting should be avoided. Cover crops should then be grown yearly, as near to the trees as is practicable. After cutting the soil should be dug and the cover crop spread evenly as a mulch. If necessary the fertility of the soil must be kept up by applying farm yard manure. Artificial fertilisers should not be used by planters before consulting experts on the subject. An unbalanced fertiliser is not only a waste of money but very often does a tremendous amount of harm from every point of view.

THE AGRICULTURAL DEPARTMENT. Mr. Harcourt, the Agricultural Superintendent invited me round the Experimental Station and showed me the different manurial and other experiments that were being conducted on limes and other crops. I was also showed the different immune varieties of limes on which some good work has recently been done.

It is a pity that the work of Mr. Joseph Jones and his successor Mr. Harcourt is not made more use of in Dominica. Very little of the advice given in this report apart from technical matters can be considered fresh information. There are proofs of the soundness of what has been advocated in the past and repeated in the present in the form of living and productive trees in the Botanic Gardens. In searching through the Annual Reports of the Department, I find that no less than thirteen articles have appeared in them between 1913 and 1924 which have dealt with lime diseases. These have also dealt with important matters in citrus culture including draining, budding, resistant stocks, manuring, and pruning. In the 1916 Report it is stated that large numbers of the Mycologist's (Mr. Nowell's) report were distributed to planters free of charge. This report amongst other things advocated the use of resistant stocks. Everything possible has been done by the Department to further the interest of the planting community. Most of the planters have failed to follow this sound advice. One of the results of this neglect is the present epidemic of root disease. Had the advice been followed there would have been little or no disease.

At the Botanic Gardens none of the lime trees on Sour Orange stock have contracted disease. On some of the estates devastated by root disease a few trees of Grapefruit and Washington Navel Oranges still remain healthy.

I recommended to the Agricultural Superintendent that all young seedling limes in the nursery should be destroyed, and none raised in future except for possible experimental purposes. Furthermore, that limes on Sour Orange should be budded at from 12—18 inches above soil level and the highest selected for use on estates subject to the effects of flooding.

During my visit to Dominica, it struck me that the officers of the Department spent a great deal too much of their time at meetings of different organisations and answering routine correspondence. Experimental work under such conditions is extremely difficult.

GENERAL DISCUSSION. So far I have dealt with the situation in regard to root disease only, but when viewed in its broadest aspect, namely, the future prosperity of Dominica, it behoves me as a plant pathologist to take into consideration many other factors, some of which appear at first remote from the subject of plant pathology. This will be explained later.

THE WEST INDIAN LIME INDUSTRY. As the result of the losses caused by the Withertip of Limes, the first step taken to contend with the situation was the recommendation of spraying. There are some who still hold that this is a possibility, but my views on the matter have already been stated. While spraying was to hold the disease in check, it was recommended to breed an immune variety of lime which would replace the West Indian.

In the first place I would point out that the market for the West Indian lime is already established, and so far, and probably for many years to come, there will be found no lime which can replace the West Indian. It has several qualities which the best of the immune varieties, so far produced, do not possess. Furthermore it is a matter of opinion whether the West Indian lime cannot be produced in sufficient quantity, in spite of the Withertip, to hold the market Extension of the lime market is another matter, but I consider that with the improved methods of horticulture on the lines indicated above and provided the areas under limes are carefully selected in Dominica and some of the other islands where, in spite of Withertip, economic crops can be produced there is no necessity to replace the West Indian lime. I made enquiries from Mr. Collens concerning the possible extension of lime growing in Antigua. The answer of Mr. Collens, Superintendent of Agriculture of the Leeward Islands, and Mr. Gallway, the Agricultural Superintendent, Antigua, is summarised in the following table.

Estate.	*Acreage now under limes.*	*Available acreage for lime cultivation.*	*Proposed extension.*
Body Ponds	12	75 — 100	As much
Dimsdale	30	150 — 200	as
Mill Hill	1	100 — 175	possible.
Christian Valley	2	100 — 150	
Orange Valley	–	75 — 100	
Tottenham Park	–	75 — 100	
Claremont		50 — 75	
Sawcolts	–	75 — 100	
Wallings	–	75 — 100	

If, however, it is desired and possible to increase appreciably the output of lime products from the West Indies, one or two of the best immune varieties might replace the West Indian lime in localities which are so wet as to make the growing of the West Indian lime impossible. The good work of Mr. Harcourt on immune varieties of limes therefore has its possibilities in the future. I understand that when Mr. Harcourt read his paper in Dominica the opinion expressed was that the work was of little use and it was recommended to plant coconuts in Dominica by the hundreds of thousands. This was not sound policy, and the procedure was extremely irregular and open to grave criticism.

As a plant pathologist, I would warn Dominicans not to plant up large areas of any single crop which has been recommended to them. There is a limit to the metabolic plasticity of any crop and particularly coconuts. Coconuts are alright provided they are planted on suitable land. Incidentally, there is a disease of coconuts known as Phytophthora bud-rot. This is quite capable of developing to an epidemic extent, particularly in a place like Dominica where the rainfall is high. The crop is also subject to Wilt disease if grown on unsuitable soil. This disease has also the disconcerting characteristic of killing the palm just when it is coming into bearing. I am not putting unnecessary difficulties in the way of those interested in coconut growing in Dominica, but every crop grown in Dominica must be planted only in localities suitable to it. Planting must, in other words, be done with judgment and no rush should be made towards the mass production of any single crop. Years ago Coffee was the one main crop. I have been informed that it was abandoned owing to an epidemic of Leaf miner. Then came limes and the eggs were all in one basket again. History has repeated itself and now the tendency is to rush to coconuts. Past experience ought to be taken as a warning against such a policy.

There are possibilities in Dominica for the production of citrus fruits other than limes, e.g., Grapefruit and Washington Navel Oranges. The few trees on the Shawford Estate for example are several years old, healthy looking and bear good crops. This is one of the estates which is outside the economic limit for the West Indian Lime because of Withertip, and this year it has been to all intents and purposes completely wiped out by root disease. The same caution, however, must be exercised with these two fruit crops as with anything else. They must be grown in suitable localities. Furthermore, the question of variety in Grapefruit is of paramount importance. Now that Trinidad is developing its fruit industry along sound lines, it would be as well for the members of the Agricultural Society in Dominica to get into communication with people in Trinidad about this matter. The unit

of production is the West Indies not Dominica, and it would be folly to grow many different varieties in the different islands. With a West Indian marketing organisation at the market end, the fruit and other produce, if of a uniform quality and variety, could be centralised to advantage. Furthermore, the date of ripening would possibly vary slightly in Dominica as compared with Trinidad, and this would tend to keep the market supply more constant over a longer period. This would be beneficial to both islands. This is also applicable to some parts of St. Lucia. There are other crops such as Cacao, Vanilla, Ginger, Avocado Pear, Nutmegs, Mango, (the Julie mango might replace the common mango as windbreaks) and lastly but not least Rubber. I cannot help but think that Rubber(Hevea) might very profitably be grown in some parts of Dominica. I have been informed that there was a small plantation which on tapping gave a very good latex yield for a time, that later the yield fell off badly. If any of these trees are still living a tapping experiment might again be tried because it is quite possible that Brown Bast disease set in as the result of over-tapping. This is a danger whenever Rubber is grown."

Specimens of various fungi were forwarded to Professor Ashby of the Imperial Bureau of Mycology on his request for a collection; he reported on them as follows :—

"*Nos. 1, 3 & 4.* Entomogenous fungi on snow scale on citrus bark. This is the red-headed fungus (*Microcera sp.*) often referred to in the publications of the Imperial Department, West Indies, as *Sphærostilbe coccophila* (De sm.) Tul. Only the conidial form was present. In 1, the white-headed fungus (*Tetracium sp.*) was also present; it is often mentioned in the older literature as *Ophionectria coccicola* E. & E. (*Pondonectria*) E. & E.) Petch.

Nos. 2 & 13 (upper part).

The black fruiting bodies were too immature to be identified.

Nos. 5 & 7.

The fungus present, a close relative of the red-root disease fungus, does not appear to have been previously reported from the Lesser Antilles. It is probably identical with the form recorded as a parasite on a plant cultivated in S. Brazil—"aipim" also known as sweet cassava (*Manihot palmata* var. *aipi*); it was also found on decaying wood in the forest. The species in question is *Corallomyces jathrophæ* Moll. I found it and recorded it on banana rhizomes in Jamaica. Its identification is not quite certain as both the Dominica and Jamaica material showed only the conidial stage, reddish yellow cups a few millimetres in height and width; it appears to form flattened rhizomorphic sheets with toothed margins of a whitish colour in the bark of the lime roots. Its parasitism may be even weaker than that of the red-root fungus; the infection probably occurs by contact of living roots with rotting wood (buried logs, stumps, etc.), in poorly drained situations. Was No. 5 from the same locality (Shawford) as No. 7? I shall be glad to have some more of this fungus when you come across it again, inclusive of a piece of the root to show the internal mycelium.

No. 6. This is red-root disease; I have the fungus in culture from the fresh specimens sent by Mr. Rose and think there can be no doubt that it is the *Sphærostilbe repens* B. & Br. of the East (see Petch "Diseases of the Rubber Tree" pp. 64-69. 1921—not the earlier edition.)

No. 8 is a Nectria sp. not yet identified.

No. 9. The white stars and fans on the wood suggest very strongly *Rosellinia pepo* Pat. one of the two kinds causing black-root disease of limes in Dominica.

No. 10. The reddish brown woolly flat strand with delicate white expansions on the surface of the root I have not been able to identify with any known parasite fungus; it is probably only a saprophyte.

No. 11. The reddish strands on the root resemble those of *Fomes lignosus* Kl. although they are usually white or yellowish. If it is that species the tree will be killed and should be kept under observation. This fungus has not been recorded on limes in the West Indies, but is world-wide in its distribution and a dangerous parasite (see Petch. l.c. for coloured drawings of the fruitifications when *fresh.*)

No. 12. The red stalked conidial bodies and the depressed dark red perfect fructifications were those of *Megalonectria pseudotrichia* (Schw.) Speg. The conidial stalks (known as *Stilbella cinnabarina* (Mont.) Lind.) are smooth throughout whereas those of red-root disease are hairy below. It is known only as a saprophyte.

No. 15. was rather too scanty to make anything of. It might be a mild case of "slime disease" (*Bacterium solanacearum* E. F. Sm.) as some brown streaks were present in the outer wood filled with bacteris.

No. 14. (Vanilla buds) had a *Fusarium sp.* on the surface which is common on decaying floral parts of various plants in the tropics. I doubt if it was parasitic.

Your No. 16 (cabbage stems) showed the vessels in the brown strands filled with bacteria and I strongly suspect the disease to be "black-rot" caused by *Bacterium campestre* (Pam) E.F. Sm.

REPORT OF THE LIME EXPERIMENT STATION, DOMINICA.

This Station was started in April, 1913, and the first planting of limes was made in July of the same year. A statement showing the expenditure and the receipts during the fifteen year period is given below :—

	Expenditure.			Receipts.		
	£	s.	d.	£	s.	d.
1913 - 1914	50	0	0	17	9	7
1914 - 1915	70	0	0	61	1	5
1915 1916	120	0	0	86	9	10
1916 - 1917	175	0	0	121	2	11
1917 - 1918	175	0	0	180	12	2
1918 1919	200	0	0	233	12	8
1919 - 1920	250	0	0	625	6	7
1920 - 1921	320	0	0	741	8	2
1921 1922	400	0	0	456	8	3
1922 - 1923	350	0	0	423	1	2
1923 1924	350	0	0	515	3	5
1924 - 1925	332	10	8	662	3	9½
1925 - 1926	341	3	4	671	10	10
1926 1927	334	17	3	1,135	7	4½
1927 1928	336	17	7	1,018	13	2½
Cost of manures to date	487	0	0			
Cost of drainage (from special Grant) ...	48	3	0			
Head Labourer's house	60	0	0			
Shed for housing mill, etc.	100	0	0			
Watchman's House	12	10	0			
Total	£4,512	1	10	£6,949	9	4½

Supervision always a considerable charge, has cost nothing in this instance, the work being done by the Agricultural officers. A fair amount of assistance has also been given by the Agricultural pupils who have been under training during recent years. These pupils were from time to time engaged in sowing green dressings, applying manures, pruning the trees and other work of a light character.

It should be clearly understood that the figures of expenditure given above not only maintain the present bearing acres of limes, which includes the gathering, but also covers the cost of upkeep of about five acres of young lime cultivation, eight acres of young coco-

nuts, and a further area of three acres consisting of grapefruit, camphor, avocado pears, etc.

During the fifteen years of its existence the Experiment Station, so far as the disposal of the crop is concerned, has been in the position of a small grower; that is the ripe and green limes have had to be sold in the open market at the current ruling prices. For the purpose of record a table has been prepared which shows the local market rates per barrel of fruit since 1914-1915 :—

RIPE LIMES.

Year.	Barrels of Limes.	Amount received	Average Rate per barrel.
		£ s. d.	£ s. d.
1914-15	222	61. 1. 5.	5. 6.
1915-16	315	86. 9. 10.	5. 6.
1916-17	541	121. 1. 1.	4. 5½
1917-18	649	180. 12. 2.	5. 6¾
1918-19	1,070	221. 2. 8.	4. 1½
1919 20	1,589	498. 1. 6.	6. 5½
1920-21	2,571	688. 17. 4.	5. 4½
1921-22	2,485	456. 8. 3.	3. 8.
1922-23	2,916	423. 1. 2.	2. 10¾
1923-24	2,502	453. 15. 5.	3. 7½
1924-25	2,684	629. 11. 9½	4. 3¾
1925-26	2,792½	630. 7. 6.	4. 6.
1926-27	2,475	1,053. 3. 8½	8. 6½
1927-28	2,239	993. 18. 11½	8. 9¼

GREEN LIMES.

Year.	Barrels of Limes.	Amount received.	Average Rate per barrel.
		£ s. d.	£ s. d.
1918-19	10	12. 10. 0.	1. 5. 0.
1919 20	191	127. 5. 1.	13. 3¾
1920-21	55½	52. 10. 10.	18. 11.
1921 22	—	—	
1922 23	—	—	—
1923 24	66	61. 8. 0.	18. 7.
1924-25	40	32. 12. 0.	16. 3½
1925-26	42	41. 3. 4.	19. 7½
1926-27	66	82. 3. 8.	1. 4. 11.
1927-28	20	24. 14. 3.	1. 4. 8½

The Experiment Station crop for the year under review was 2,239 barrels of ripe limes and 20 barrels of green limes, most of which were sold in the local market and realised the sum of £1,018. 13. 2½. The total crop for the year was 2,259 barrels of fruit, a slight decrease on that of the previous year.

MANURIAL EXPERIMENTS WITH LIMES.

The main manurial experiments now carried on consist of five plots three times repeated, two series with young limes, and one series with old limes. They are as follows:—

A. Complete manure of nitrogen, phosphates, and potash.

B. Control. No manure.

C. Mulch of grass, 5 tons per acre.

D. Nitrogen and phosphates.

E. Nitrogen and potash.

In each case the nitrogen was originally applied in the form of Swift's manure 8 per cent ammonia at the rate of 4 cwt. per acre, but for a period of three years this manure could not be obtained, and the equivalent in the form of Cotton Seed meal was applied instead. During the past three years dried blood, 14 per cent ammonia has been used.

The phosphatic requirements of the plots are furnished in the form of basic slag, applied at the rate of 4 cwt. per acre, and the potash by sulphate of potash at the rate of 1½ cwt. per acre. During 1920–1921 neither of these manures could be obtained and the falling away of the crop during 1921–1922 is in some measure due to the lack of these fertilizers. During recent years sulphate of potash was again available, and as basic slag could not be got, 16 per cent acid phosphate was used in its place.

The mulch applied is mainly in the form of lemon grass, supplemented by leaves and young shoots of *Gliricidia maculata*. Both forms of mulch are especially grown on what would otherwise be waste grounds in the vicinity of the plots. This system of utilising odd corners, steep hill-sides, and the banks of streams for growing material for application to cultivated areas is strongly recommended in Dominica.

In perusing the plot returns for the past year, allowance must be made for the unequal effect on the different plots, of the severe storm of July, 1926, and also an outbreak of Red Root disease affecting about 100 trees.

The yields of these plots in barrels of fruit, during the period 1917–1918 to 1927–1928, are given below:—

ELEVEN YEAR'S RESULTS OF MANURIAL EXPERIMENTS WITH LIMES.

ORIGINAL SERIES.

Trees planted July, 1913.

		A.		B.		C.		D.		E.	
		1.		2.		3.		4.		5.	
Year.	Size of plots.	Complete manure.		Control.		Mulch.		Nitrogen and Phosphates.		Nitrogen and Potash.	
		per plot.	per acre.	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.
1917–18	¼-acre	15¾	63	14	56	23¾	95	23¾	95	7¾	31
1918–19	,,	60	240	45¾	183	71¾	287	58½	234	34¾	139
1919–20	,,	85	340	89½	358	99½	398	88½	354	60½	242
*1920–21	,,	118¾	475	109¼	437	130½	522	117½	470	112	448
1921–22	,,	95	380	85¾	343	99	396	85¾	343	86	344
1922–23	,,	88	252	68½	274	85½	382	81½	326	90½	362
†1923–24	,,	56½	225	47¼	189	69¾	279	56½	226	63	252
1924–25	,,	51	204	38	152	53¼	213	37	148	48¾	195
1925–26	,,	50¼	201	31½	126	50¼	201	49¼	197	42¾	171
1926–27	,,	47½	190	28¼	113	49¼	197	43	172	41½	166
1927–28	,,	44¼	178	21½	86	47	188	37¾	151	31¼	125

* No phosphates or potash applied that year.

† First complete year under "Withertip" conditions.

DUPLICATE SERIES.

Trees planted July, 1913.

Year.	Size of plots.	A. 6. Complete manure.		B. 7. Control.		C. 8. Mulch.		D. 9. Nitrogen and Phosphates.		E. 10. Nitrogen and Potash.	
		per plot.	per acre.	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.
1917–18	¼-acre	6¾	27	10¼	41	18	72	6¾	27	10¾	43
1918–19	,,	34¾	139	22½	90	42¼	169	30	120	38½	154
1919–20	,,	57¾	231	38	152	69¾	279	60½	242	72½	290
*1920–21	,,	117	468	81½	326	115½	462	105¾	423	115¾	463
1921–22	,,	79	316	52¼	209	85½	342	81	324	94	376
1922–23	,,	77	308	45	180	80	320	82	328	97	388
†1923–24	,,	55¼	221	35¾	143	60½	242	54	216	70½	282
1924–25	,,	47	188	29¼	117	46	184	40½	162	56½	226
1925–26	,,	37¾	151	21	84	47½	190	50¼	201	55½	222
1926–27	,,	32½	130	20¼	81	44	176	41½	166	48	192
1927–28	,,	33¾	135	13	52	33¼	133	32¾	131	48¾	195

TRIPLICATE SERIES.

Old Trees planted 1893.

Year.	Size of plots.	A. 11. Complete manure.		B. 12. Control.		C. 13. Mulch.		D. 14. Nitrogen and phosphates.		E. 15. Nitrogen and Potash.	
		per plot.	per acre.	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.
1917–18	¼-acre	45	180	29¾	119	25½	102	27½	110	22¾	91
1918–19	,,	70	280	32½	130	23	92	52½	210	34½	138
1919–20	,,	89¾	359	48½	194	32	128	67¼	269	50	200
*1920–21	,,	85¼	341	52½	210	43¾	175	97	388	64¾	259
1921–22	,,	74	296	42½	170	40	160	79	316	73¾	295
1922–23	,,	69	276	34	136	37	148	86	344	70	280
†1923–24	,,	54½	218	26½	106	45¼	181	61¼	245	56¼	225
1924–25	,,	35¼	141	21	84	35	140	48½	191	43	182
1925–26	,,	40¼	161	24½	98	36	144	38¾	155	43	182
1926–27	,,	39	156	19	76	42	168	52¼	209	48½	194
1927–28	,,	37¾	151	18¾	75	34	136	38	152	46½	186

*No phosphates or potash applied that year,

†First complete year under "Withertip" conditions.

The ten plots of young limes, which cover an area of 2½ acres were planted in July 1913, and are therefore, at the end of March, 1927, thirteen years and nine months old from the time of being placed out in the fields. The crop returns during this period are as follows:—

1917-18	5th year	...	137½	barrels or	55	barrels per acre.		
1918-19	6th ,,	...	438¾	,, ,,	175	,,	,,	,,
1919-20	7th ,,	...	721½	,, ,,	288	,,	,,	,,
*1920-21	8th ,,	...	1,124	,, ,,	450	,,	,,	,,
1921-22	9th ,,	...	844½	,, ,,	338	,,	,,	,,
1922-23	10th ,,	...	805	,, ,,	322	,,	,,	,,
†1923-24	11th ,,	...	568¾	,, ,,	227	,,	,,	,,
1924-25	12th ,,	...	447¼	,, ,,	179	,,	,,	,,
1925-26	13th ,,	...	436	,, ,,	174	,,	,,	,,
1926-27	14th ,,	...	396	,, ,,	158	,,	,,	,,
1927-28	15th ,,	...	343¼	,, ,,	137	,,	,,	,,

A better idea of the effects of the various manures and cultural measures carried on, may be gained from the table below, in which the plots, each receiving identical treatment in the three series of experiments, are grouped together. This table shows at a glance the actual yield per three plots of a kind grouped together, the calculated yield per acre, and the increase or decrease per acre per annum compared with the previous year.

3 COMPLETE MANURE PLOTS. (¼ ACRE EACH.)

Year.	Acre.	Yield in Barrels per ¾ Acre.	Calculated yield in barrels per acre.	Increase or decrease per acre compared with previous year.
1917-18	¾ Acre.	67½	90	
1918-19	,,	164¾	219⅔	+ 129⅔
1919-20	,,	232½	310	+ 90⅔
*1920-21	,,	321	428	+ 118
1921-22	,,	248	330⅔	— 97½
1922-23	,,	234	312	— 18
†1923-24	,,	166½	222	— 90
1924-25	,,	133¼	177	— 44⅔
1925-26	,,	128¼	171	— 6⅔
1926-27	,,	119	158⅔	— 12⅓
1927-28	,,	115¾	154	— 3¼
		1,930½	=Total yields for 11 years.	

* No phosphates or potash applied that year.

† First complete year under "Withertip" conditions.

3 CONTROL PLOTS (¼ ACRE EACH.)

Year.	Acre.	Yield in Barrels per ¾ Acre.	Calculated yield in barrels per acre.	Increase or decrease per acre compared with previous year.
1917-18	¼ Acre.	54	72	
1918-19	,,	100¾	134⅔	+ 62⅔
1919-20	,,	176	234⅔	+ 100⅓
*1920-21	,,	243¾	324⅔	+ 89⅔
1921-22	,,	180¼	240⅓	— 84
1922-23	,,	147	196	— 44⅓
†1923-24	,,	109½	146	— 50
1924-25	,,	88½	118	— 28
1925-26	,,	77	102⅔	— 15⅓
1926-27	,,	94½	126	+ 23⅓
1927-28	,,	53¼	71	— 41¼
		1,324	=Total yield for 11 years.	

3 MULCH PLOTS. (¼ ACRE EACH.)

Year.	Acre.	Yield in Barrels per ¾ Acre.	Calculated yield in barrels per acre.	Increase or decrease per acre compared with previous year.
1917-18	¾ Acre.	67¼	89⅔	
1918-19	,,	138	184	+ 94⅓
1919-20	,,	201¼	268⅓	+ 84⅓
*1920-21	,,	289¾	386	+ 117⅔
1921-22	,,	224½	299⅓	+ 86⅔
1922-23	,,	212	282⅔	— 16⅔
†1923-24	,,	175¾	234⅓	— 48⅓
1924-25	,,	135	180	— 54
1925-26	,,	133¾	178⅓	— 1⅔
1926-27	,,	135¼	180⅓	+ 2
1927-28	,,	114¼	152⅓	— 21
		1,826¾	=Total yield for 11 years.	

* No phosphates or potash applied that year.

† First complete year under "Withertip" conditions.

3 NITROGEN AND PHOSPHATES PLOTS. (¼ ACRE EACH.)

Year.	Acre.	Yield in Barrels per ¾ Acre.	Calculated yield in barrels per acre.	Increase or decrease per acre compared with previous year.
1917–18	¾ Acre.	64¾	86⅔	
1918–19	,,	141	188	+ 101⅔
1919–20	,,	216¼	288⅓	+ 100⅓
*1920–21	,,	320¼	427	+ 138⅔
1921–22	,,	240½	320⅔	— 106⅓
1922–23	,,	250	333⅓	+ 12⅔
†1923–24	,,	171¾	299	— 104⅓
1924–25	,,	126	168	— 61
1925–26	,,	138¼	184⅓	+ 16⅓
1926–27	,,	136¾	182⅓	— 2
1927–28	,,	108½	144⅔	— 28¼
		1,914	=Total yield for 11 years.	

3 NITROGEN AND POTASH PLOTS. (¼ ACRE EACH.)

Year.	Acre.	Yield in Barrels per ¾ Acre.	Calculated yield in barrels per acre.	Increase or decrease per acre compared with previous year.
1917–18	¾ Acre.	41¼	55	
1918 I9	,,	107¾	134⅔	+ 83⅔
1919–20	,,	183	244	+ 100⅓
*1920–21	,,	292½	390	+ 146
1921 22	,,	253¾	338⅓	— 51⅔
1922–23	,,	257	342⅔	+ 3⅔
†1923–24	,,	190	253¼	— 89½
1924–25	,,	148	197	— 56
1925–26	,,	141¼	188⅓	— 8⅔
1926–27	,,	138	184	— 4⅓
1927–28	,,	126½	168⅔	— 12½
		1,879	=Total yield for 11 years.	

* No phosphates or potash applied that year.

† First complete year under "Withertip" conditions.

The falling off in yields on the above mentioned plots was due to (1) The presence of the Withertip disease of limes which was first noticed in the Experiment Station in July, 1922, (2) The storm of the 22nd July, 1926 and (3) an outbreak of Red Root disease.

Judging by Dominica standards, all the plots, including those receiving no manure have done well. In the latter instance the influence of good cultural measures, apart from the application of manures must be evident to all who study the table of crop returns.

The mulched plots, although not giving the highest return, are of special interest to lime growers. As is well known this material is without the forcing effect of concentrated fertilizers, but it is cumulative in its effect. It is practically certain that the standard of health of the lime tree is higher in the mulched than in any of the plots receiving concentrated manures only. This material which is so abundant in the Island, should be chiefly used by cultivators.

Other Manurial Experiments Plots.

Both seedling and spineless limes budded on sour orange stock, and ordinary seedlings have been under experiment since 1914, and occupy one acre of land.

The acre is divided up into ¼ acre plots: two plots of common limes budded on sour orange stocks: one plot of spineless limes on the same kinds of stock: and one plot of ordinary seedling limes for comparison.

During 1917-18 and 1918 19 the trees in each plot received a small dressing of organic nitrogen at the rate of 4 cwt. per acre. During the first three years of their existence, No. 1 budded plot (see table below) was grown with Tephrosia as a green dressing whilst No. 2 budded plot was grown in the usual way with weeds and grass, which was occasionally weeded. The spineless limes had green dressings of horse beans, and the seedling limes were clean weeded. Early in 1919-20 each plot received a complete manure of nitrogen, phosphates and potash. It is intended to maintain this series as complete manure plots. The crop yields of the four plots since fruiting are as follows :—

Eleven Years Results of Experiments conducted with Spineless and Common Limes, Budded on Sour Orange Stocks, and with Common Seedling Limes.

Planted July, 1914.

Spineless Limes Budded on Sour Orange Stocks.

Year.	Size of plot.	Actual yield in barrels per plot.	Calculated yield in barrels per acre.
1917-18	¼ Acre	6½	26
1918-19	,,	18¼	73
1919-20	,,	34	136
*1920-21	,,	46	184
1921-22	,,	45½	182
1922-23	,,	62	248
†1923-24	,,	26	104
1924-25	,,	24⅝	98⅜
1925-26	,,	29¼	117
1926-27	,,	16½	66
1927-28	,,	23¾	95

* No phosphates or potash applied that year.

† First complete year under "Withertip" conditions.

COMMON LIMES BUDDED ON SOUR ORANGE STOCKS. (No. 1.)

Year.	Size of plot.	Actual yield in barrels per plot.	Calculated yield in barrels per acre.
1917–18	¼ Acre	8	32
1918–19	,,	34¾	139
1919–20	,,	39¾	159
*1920–21	,,	98½	394
1921–22	,,	91¾	367
1922–23	,,	132	528
†1923–24	,,	59	236
1924–25	,,	59⅔	238⅔
1925–26	,,	68¼	273
1926–27	,,	48½	194
1927–28	,,	50½	204

COMMON LIMES BUDDED ON SOUR ORANGE STOCKS. (No. 2.)

Year.	Size of plot.	Actual yield in barrels per plot.	Calculated yield in barrels per acre.
1917–18	¼ Acre	6	24
1918–19	,,	13¾	55
1919–20	,,	31¼	125
*1920–21	,,	86	344
1921–22	,,	73¾	295
1922–23	,,	121	484
†1923–24	,,	65¼	261
1924–25	,,	67¼	269
1925–26	,,	76	304
1926–27	,,	57¼	229
1927–28	,,	56	224

*No phosphates or potash applied that year,

†First complete year under "Withertip" conditions.

COMMON SEEDLING LIMES.

Year.	Size of plot.	Actual yield in barrels per plot.	Calculated yield in barrels per acre.
1917-18	¼ Acre	Nil.	Nil.
1918-19	,,	16¾	67
1919-20	,,	22¾	91
*1920-21	,,	61	244
1921-22	,,	58	232
1922-23	,,	64½	258
†1923-24	,,	55¾	223
1924-25	,,	50½	201
1925-26	,,	42¼	169
1926-27	,,	40	160
1927-28	,,	34½	138

Attention must again be called to the relative high yield of the West Indian Limes budded on Sour Orange stocks. These plots are situated in that part of the Station most affected by Withertip, despite which they persistently give the highest returns. Compared with seedling limes they make a stronger and quicker growth, are of better habit, and not so susceptible to dieback and root troubles. The strong rooting quality of this stock was strikingly demonstrated when during last year's storm not a single tree was blown over or uprooted. This alone should vindicate its right to be regarded the stock for the West Indian lime on suitable soils.

RECENTLY STARTED MANURIAL EXPERIMENT PLOTS.

Three new series, each consisting of three plots, were started early in 1921. The treatment given in the first series is repeated three times. The plots are numbered 16 to 24. The treatment is as follows:—

SERIES. 1.
- Plot 16. Ready mixed complete fertilizer, (8 per cent nitrogen, 10 per cent phosphates and 4 per cent potash), at the rate of 500 lbs. per acre (with mulch—2½ tons per acre.)
- Plot 17. Control. (No fertilizer or mulch.)
- Plot 18. Ready mixed complete fertilizer, (8 per cent nitrogen, 10 per cent phosphates and 4 per cent potash), at the rate of 1000 lbs. per acre (with mulch –2½ tons per acre.)

The addition of nine plots brings the number of experiment plots now being conducted at the Station, up to thirty. The twenty-one plots running before the new experiments were started involved no less than 1809 separate measurements and records, and average of eighty-six pickings per plot. With the addition of three new series this work connected with measuring and recording will be greatly increased involving as it will close on 2,600 measurements each year.

The following tables show the returns for the six years since the commencement of the experiments :—the yields being expressed in barrels.

* No phosphates or potash applied that year.

† First complete year under "Withertip" conditions.

SERIES I.

Year.	A. (16) Complete Manure. (500 lb. Mixed Fertilizer per acre.)		B. (17) Control. (No Manure.)		C. (18) Complete Manure. (1,000 lb. Mixed Fertilizer per acre.)	
	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.
1921-22	17	60½	10	30	20	68
1922-23	46	164	28¼	85	65½	225½
1923-24	50	197½	36½	110½	64¾	223
1924-25	55½	199	46¾	141½	66¼	228
1925-26	51	182½	32¾	99	56	193
1926-27	51	182½	28	84	58¼	201
1927-28	35½	124	22¼	66	41½	140¼

SERIES II.

Year.	D. (19) Complete Manure. (500 lb. Mixed Fertiliser per acre.)		E. (20) Control. (No Manure.)		F. (21) Complete Manure. (1,000 lb. Mixed Fertilizer per acre.)	
	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.
1921-22	6½	23	8¾	22	3½	10½
1922-23	18¼	65	31¼	80	42¼	128
1923-24	32	114	54	138½	62¾	190
1924-25	51½	184	57¾	148	66	200
1925-26	69½	248	44	112¾	69½	210⅔
1926-27	58	207	47½	122	64¼	194½
1927-28	42	150	56½	92⅓	60¼	180½

SERIES III.

Year.	G. (22) Complete Manure. (500 lb. Mixed Fertilizer per acre.)		H. (23) Control. (No Manure)		I. (24) Complete Manure. (1,000 lb. Mixed Fertilizer per acre.)	
	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.
*1921-22	36½	101½	31	91	45¾	147½
1922-23	23½	65	21¾	64	22¾	73
1923-24	22¾	63	20¾	61	22¾	73
1924-25	29¼	81	20½	60	25	80½
1925-26	35	97½	21	61¾	32	103
1926-27	38½	107	22¼	64¾	31½	101½
1927-28	32	87½	23	67	30¾	96¾

The areas of all the above plots are slightly over ¼ acre each, therefore the value in barrels per acre has been given to the nearest fraction.

* Higher returns due to some seedling limes which had not been removed from amongst the budded plants.

AGRICULTURAL LOAN BOARD.

The Loan Board functioned as usual throughout the year and advances were made to a considerable number of estates. As stated in the last report, it is the duty of the Agricultural Superintendent, assisted by his senior assistants, when necessary, to investigate all applications for loans and to submit a report giving observations concerning the estate, together with recommendations. This necessitates a considerable amount of travelling which in consequence of the mountainous character of the island is extremely arduous. In many instances the estates are situated far apart and can only be reached after many hours riding on horseback over rough and dangerous roads or tracks. It is also a condition of the Board that moneys advanced should be expended to the satisfaction of the Department, which means that all estates benefiting have to be as far as possible under the Department's eye, and inspected and reported on prior to each advance. As the number of estates receiving assistance continues to increase it is difficult to see how this work can be efficiently performed in the future by the present staff of the Department especially as the services of the 2nd Assistant Curator have now been acquired for secretarial work by the Board. It naturally follows that the usual work of the Department must suffer to some extent in view of this handicap unless provision is made to cope with it.

Loan Board work is generally looked upon as the principal work of the Department, further particulars of which cannot be given in this report as all Loan Board matters are treated in a highly confidential manner.

GOMIER STEWART TRUST ESTATE.

As mentioned in last year's annual report, the Government of Dominica, by an Order of the Court is a Trustee of this Estate which is a large property consisting of 200 acres, more or less, situate in the Parish of Saint George, on the North-easterly boundary of Wall House Estate.

It was decided that the Estate be placed under the control of the Agricultural Department, half the property to be rented out to peasants in plots of four to five acres and the remaining half to be rented to the present tenant of the whole estate.

The rents of these plots are from 10/- per acre upwards according to the quality of the land, the rent money to be utilised for the benefit of the poor.

Thirty-two tenants have been apportioned land, which they are industriously cultivating. Periodical visits by Officers of the Department are made for the purposes of supervision and giving advice.

Satisfactory progress has to be reported.

DETAILS OF ADMINISTRATION.

Expenditure.

The local votes for the Agricultural Department for the year were as follows:—

	£	S.	D.
Salaries Curator, Assistant Curator, Clerk, Foreman and Watchman	1,066	0	0
Contingencies	13	0	0
Travelling Expenses	100	0	0
Maintenance	290	0	0
Cultivation of Saleable Products and minor Industries	375	0	0
Fumigation of Imported Plants		—	
Maintenance Public Gardens		—	
Purchase Special Manures	120	0	0
Printing Reports etc.	40	0	0
Experiment Station	390	0	0
Purchase of Seeds		—	
Chemicals and Apparatus	25	0	0
Telephone Rental	20	0	0
Uniform Watchman		—	
Upkeep of Horses and Mules	30	0	0
Agricultural Instruction	322	0	0
	£2,791	0	0

The actual expenditure during the year under the above heads was £2,408. 15. 1.

Additional Expenses for Special Services.

Grant for free distribution of economic plants ... £740. 12. 7.

Receipts.

The receipts under the various heads were as follows:—

	£	S.	D.
Limes	1,018	0	0
Cocoa	231	4	11
Plants	75	5	7
Fruit	36	10	0
Nutmegs	3	13	9
Coconuts	9	8	1
Onion Seed	10	19	3
Vegetable Seed	9	8	6
Tobacco Seed	0	6	3½
Tobacco	8	18	0
Wood	2	3	6
Miscellaneous	5	18	6
Laboratory Receipts	16	9	11
	£1,428	6	3½

STAFF CHANGES, ETC.

Mr. J. W. Wright, Assistant Curator, who proceeded on vacation leave on the 28th February, returned and resumed his duties on the 10th September, 1927.

Mr. F. L. Squibbs, 2nd Assistant Curator, was granted and proceeded on leave of absence from the 17th June to the 13th July.

The Hon. F. G. Harcourt, Curator and Agricultural Superintendent, proceeded on vacation leave on the 10th December, 1927.

Mr. L. Oscar was engaged on the 15th June as an Overseer (temporary).

The Curator and Superintendent of Agriculture, who is a member of the Executive and Legislative Councils, served as Chairman on various Committees during the year.

The secretaryship of the Permanent Exhibition Committee was carried out by Mr. F. L. Squibbs. Mr. Squibbs was appointed to act as Secretary to the Loan Board on the 16th of January, 1928.

REPAIRS TO BUILDINGS, ETC.

The supports to, and staging of one of the propagating houses were totally refitted. A new pair of gates was furnished to one of the main entrances to the Gardens.

CORRESPONDENCE AND DISTRIBUTION OF INFORMATION ON AGRICULTURAL MATTERS.

One thousand and sixty-nine letters were despatched from the Department's Office, not including over one thousand notifications sent out in connection with plant distribution. The number of Minute Papers dealt with excluding numerous Loan Board Papers was three hundred and thirty-one. The office work of the Department has increased to such an extent that much valuable time of the Senior Officers of the Department is utilised to cope with it.

Various pamphlets and copies of reports were distributed to planters interested.

PLANTS AND SEED EXCHANGE.

Contributions of seeds and plants were received from the following: – R. O. Williams, Esq., Trinidad. Agricultural Department, Antigua. Imperial Commissioner of Agriculture. H. G. Seaford, Esq., J. Sowray, Esq., Hon. A. E. Collens, A. Gomez, Esq., United States Department of Agriculture, Prof. Juan Balme Apartado, Mexico; R. H. Parker, F.C.H., Forest Botanist, Dehra, Dun, India; J. W. Wright, Esq., Conservator of Forests, Belize, British Honduras; W. S. Barrett, Esq., Bureau of Agriculture, San Juan; Agricultural Experiment Station, Mayaguez, Porto Rico; Vilmorin Andrieux & Co.

The Department tenders its best thanks for these welcome contributions.

Seeds and plants were sent to :—The Agricultural Department, Antigua; Botanic Gardens, Montserrat; Major Hole, Antigua, and Royal Botanic Gardens, Kew.

OFFICIAL VISITS ETC. TO THE DEPARTMENT.

His Excellency the Governor and Lady Fiennes, O.B.E., visited the Gardens during their visit to the Island in March 1928.

Hon. A. E. Collens, F.I.C., F.C.S., Government Chemist and Superintendent of Agriculture, Leeward Islands, together with C. A. Gomez, Esq., Curator Montserrat, (en route for Trinidad) called at the office in January, 1928.

Professor Ballou, M.Sc., Commissioner, Imperial Department of Agriculture arrived in the Island on the 13th May and left on the 16th for Barbados. Dr. H. B. Briton Jones, D.Sc., (Lond.) Ph. D., D.S.C., A.R.C.S., Professor of Mycology and Bacteriology Imperial College of Tropical Agriculture, visited the Gardens when passing on the 13th July. He again visited the island on the 25th July for the purpose of investigating the Red Root Disease of Limes and left for Trinidad on the 4th August.

Professor E. E. Cheeseman of the Imperial College of Tropical Agriculture and H. C. Sampson, Esq., C.I.E , Economic Botanist of the Empire Market Board, called at the office on the 25th July.

AGRICULTURAL INSTRUCTION AND VISITS TO ESTATES.

A class of six pupils receive instruction at the Botanic Gardens. The course lasts for two years and training is given in general principles of Agriculture, special attention being taken to ensure their proficiency in all methods of propagation. The more advanced pupils are loaned to estates to teach budding and grafting.

A considerable amount of travelling was carried out by the officers of the Department to instruct and stimulate activity in the planting of the plants provided under the Free Plant Distribution Scheme. All Estates in receipt of loans have to be visited and reported on at frequent intervals.

The services of the Officers of the Department are always available when sought by Planters. The thanks of Officers of the Department are tendered for the kind hospitality shown by planters during visits of inspection.

LABORATORY WORK.

Work in the Laboratory was again increased during the year, and the following tests were made by the Officers of the Department.

A small fee is charged for each test made.

Raw Lime Juice	44
Concentrated Lime Juice	85
Bay Oil	94
Other Oils	3

RAINFALL.

The rainfall at the Botanic Gardens for 1927 amounted to 81.13 inches, being 21.55 inches above that of the previous year, and 6.48 inches above the average for the past twenty years.

THE LIME INDUSTRY.

The export figures for limes and lime products during the year 1927 show a decrease of 4,000 barrels over those of the previous year. The severe storm of July 1926, followed in 1927 by serious outbreaks of root disease and unfavourable weather experienced during flowering periods were in the main responsible for the decrease mentioned.

Despite the efforts made by the Department and the planters themselves the spread of Red Root disease is assuming large proportions and seriously threatens the lime industry in Dominica. The mycologist's report on the disease is given elsewhere in this report.

It is significant that Sour Orange trees growing in close proximity to diseased lime trees have proved themselves unaffected by Red Root disease, as also the few lime trees that are budded on the sour orange stock.

Judging by the rapidity of the spread of the disease, it is evident that the day of the seedling lime in Dominica is over, and planters will have to re-establish their plantations with limes budded on the sour orange stock if the industry is to be maintained. On no consideration should seedling limes be planted in diseased areas. The difficulty confronting the planter is the fact that budded limes require about two years nursery care from the sowing of sour orange seed, before they are ready for planting out into the field, and also, that at present very few plants are ready for distribution from the Department's nurseries. Planters are urged to start their own nurseries and raise as many sour orange seedlings as possible, which after careful selection should be planted into beds, where when large enough they can be budded. The Department will be pleased to give assistance with the actual budding and furthermore will undertake to train men in this particular line of work. Thousands of sour orange stocks are being raised by the Department and it is felt that by planters assisting themselves in establishing their own small nurseries, the situation will be easier to meet and the Department materially relieve pressure in a work which is one of its most important functions of to-day.

Considerable success is being obtained in grafting limes on the sour orange stock and this method promises to be a quicker form of propagation than budding. Planters engaged in either budding or grafting are particularly warned to see that the stock is not budded or grafted too close to the ground. There should be at least a distance of ten inches from soil level to the seat of bud or graft union. Failing this precaution, it is emphasised that citrus plants of all kinds will be particularly prone to Collar Rot in the future. Previous reports of this Department have pointed out the superiority of the budded plant both as regards its great resistance to storm and in yield of fruit.

The salvation or rather the restoration of the lime industry to its former flourishing condition is in the hands of those people possessing estates on the Leeward Coast. If these lands are properly planted up and improved methods of cultivation employed, there is not the slightest doubt that Dominica's production of lime products will eventually approach if not exceed that of pre-withertip days.

During the year under review the value of lime products show a marked increase, due principally to increase of demand, and shortage of supply from various causes.

Ripe limes realised up to 10/- per barrel, and green limes up to to 31/- per barrel. Lime oils also remained high, realising up to 34/- per lb. handpressed and 24/- per lb. for distilled.

The crop shipped since 1919, calculated in barrels of fruit and expressed in round numbers, is recorded below :—

	Barrels.	
1919	402,000	Prior to appearance of Withertip.
1920	369,000	
1921	516,000	
1922	400,000	
1923	229,000	
1924	424,000	
1925	230,000	
1926	214,000	
1927	210,000	

The following table calculated on the usual basis shows the disposal of the crop under various heads :—

Products.	Barrels of fruit.	Approximate percentage of total crop.
Concentrated juice ...	160,456	76. 3
Raw juice	23,179	11. 0
Fresh limes	21,577	10. 2
Pickled limes	263	.12
Lime juice cordial ...	4,647	2. 2

The export of products of the lime industry during 1927 is recorded below :—

Product.	Quantity.	Value £
Concentrated lime juice...	106,971 gallons	22,269
Raw lime juice	173,848 ,,	7,244
Lime juice cordial ...	845 ,,	127
Fresh limes	21,577 barrels	15,931
Pickled limes	263 ,,	553
Essential oil (distilled)...	31,346 lbs.	36,049
Otto of limes (hand-pressed or ecuelled)..	7,828 ,,	13,308
		£ 95,481

50 gallons of concentrated juice represents 75 barrels of lime fruits: 7½ gallons of raw juice represents 1 barrel of lime fruits 1 ton of citrate of lime is equivalent to 266 barrels of lime fruits: 1 ton of citric acid is equivalent to 400 barrels of lime fruits: 5½ gallons of lime juice cordial represents 1 barrel of lime fruits.

LIME VARIETIES.

Marked interest has been taken by one or two planters in Bears' Seedless Lime, Tahiti Lime, Woglum Lime, and Citrus Aurantifolia Lime and in consequence a lively demand is being made for these varieties, budded on the Sour Orange stock, in order that they may be given a field trial in wet districts, where withertip is very virulent. From the Department's plots little has been learned beyond that reported in last year's report, nor is there likely to be further evidence until the trees bear sufficient fruit to enable commercial tests to be made with the juice and oil. The fact that the juice of Bears' Seedless, Tahiti and Woglum lime has a flavour closely resembling that of the West Indian lime and the oil from these limes possessing an aroma also similar, and furthermore the high acid content of the juice pointing undoubtedly to the suitability of the juice for concentrating certainly warrants these particular varieties being experimented with on a field scale. At the moment none of the varieties can be recommended for extensive planting, as our experiments are not nearly complete, for it has yet to be determined if the juice and oil will be acceptable to the trade, and also if such varieties will thrive under our local conditions and bear crops to warrant their cultivation as an economic proposition. Citrus Aurantifolia invited interest in view of its heavy bearing quality and the high acid content of the juice. Judging from its behaviour in the trial plots, hopes for it in Dominica could not be entertained as the juice content of the fruit was low and the plants not of a very robust habit. The same view has to be recorded of all plants of this variety growing on the lower lands near the sea. On the other hand when grown at an altitude of 500 feet or more the tree presents a better appearance and the fruits are well filled with juice.

A great variability in shape and size of fruit has also been noted. Thanks to the interest of S. L. V. Green, Esquire, most of these varieties have been planted on a field scale on his estate at Sherwood, situated in the interior at an altitude of about 800 feet. All are growing remarkably well and appear to be better suited there than on the drier lands of the Experimental Station.

Other varieties under trial do not warrant any particular mention at present, most of them, particularly the many hybrids raised by the Department, are too young to comment on at the moment.

Five acres of land have been acquired by the Department on Copt Hall Estate, situated in the Roseau Valley and well in the withertip area, and this land will be utilised for stock trials, nursery work and for trying out varieties and hybrids recently introduced or raised.

Fruits obtained from the following varieties were forwarded to the Government Laboratory, Antigua, in the hope that sufficient oil might be extracted to afford an analytical comparison with the essential oil of the West Indian lime:—

West Indian, Woglum Lime, Bears' seedless, Tahiti, Kusai, Rangpur, Citrus aurantifolia and Woglums lemon.

Unfortunately report was received to the effect that sufficient essential oil could not be extracted from the few fruits available for chemical analysis or for the determination of yield. Extracts of the peels with silent spirit were made and the oils classified as far as possible by their aromas.

The Assistant Government Chemist states that a comparison of the alcoholic extracts allows a classification on the basis of aromas of the expressed oils which is not necessarily the identical classification that would be made based on the oils obtained by distillation.

These extracts have been forwarded to the Imperial Institute, and it is hoped that further information will be obtained for making at any rate a preliminary classification.

CITRUS INTRODUCTIONS.

A quantity of seed of a Citrus sp. was received from the Economic Botanist Nagpur India. It possesses the local name of "Kagsi Nimbu" and despite the long journey has germinated well.

One hundred and twenty-two budded plants progenys of a cross between the West Indian Lime and Citrus aurantifolia were received from the Department of Agriculture, Trinidad. These plants were propagated from 6 plants the result of the cross. Some have been planted out in the Department's experimental grounds and the remainder distributed for trial to planters.

Budwood and cuttings of the Meyer Chinese Lemon were received from the Bureau of Agriculture, Porto Rico. From this material 6 budded plants have resulted. Budwood of the following citrus varieties were a'so received from Porto Rico but owing to its dried up condition on arrival, attempts made to propagate them proved unsuccessful.

Lemon var :—Ponderosa; Lemon var :—Sicilian; Lemon Var :—Pumelo; Siamelo Pumelo; Satsumelo; Tangelo (Sanson); Eustis Limequat; Limequat (S -D.L.) Orangelo (Stokes); Lemonine. Seeds of a lime from the Solomon Islands were received from Dr. Carment.

REPORT ON CITRUS AURANTIFOLIA BY GOVERNMENT LABORATORY, ANTIGUA.

The consignment as received from the Superintendent of Agriculture, Dominica, consisted of two separate lots of fruits, viz :—

Sample A. Fruit gathered on 13th October, 1927.

,, B. Fruit gathered on 20th October, 1927.

Both samples consisted of a mixture of green and ripe fruit in which the ripe fruit predominated.

The average weight of each fruit was as follows :—

Sample A. 60.73 grammes = 2.14 ounces.

,, B. 66.63 ,, = 2.35 ,,

Average samples of ripe limes from each assortment were selected for analytical examination with the following results:--

	Samples A.	*Sample B.*
Average weight of each fruit.	70. 5 grammes = 2.49 oz.	73. 0 grammes = 2.47 oz.
Juice expressed Vol/Wt.	47. 3%	45. 5%
Juice expressed Wt/Wt.	50. 7%	47. 4%
Amount of seed in fruit.	9. 4%	7. 5%
	CONSTITUENTS OF JUICE.	
Total solids.	9.37%	8.90%
Mineral contents.	0.30%	8.90%
True Citrate acid.	8.30%	7.91%
True Citric acid ozs. per gallons.	13.12	12.66

The limes had a very thin rind and yielded a pale coloured juice with an acid flavour, but no so strongly aromatic as ordinary lime juice.

The acid present was practically all citric acid, the juice being very pure in this respect.

(Sd.) A. E. COLLENS, F.I.C., F.C.S.
Government Analytical & Agricultural Chemist.

MINOR INDUSTRIES.

FRUIT INDUSTRY.

This minor industry though still in a youthful stage has been stimulated through improved steamship facilities with Canada and also by excellent reports received on trial shipments made to Canada and England. Samples were displayed at the Toronto Exhibition, Canada, and a representative collection of Citrus fruits staged at the Imperial Fruit Show, Manchester. With reference to the latter exhibit the thanks of the Department are extended to Sir Algernon Aspinall, C.M.G., Secretary of the West India Committee, who kindly took over the exhibit on arrival and arranged for its attractive staging at the Fruit Show. His keen interest was also responsible for obtaining a Trade opinion as to the suitability of the fruit for the English Markets. The following extracts from the trade reports, will prove of interest to local growers and are included for their information and guidance:

"Letter from Sir Algernon Aspinall, C.M.G., to the Honourable H. H. V. Whitchurch.

"Forty-two cases of fruit (Dominica) were despatched to Manchester where they arrived on October 31st, the third day of the Exhibition. It was at once staged and unpacked

by Mr. G. P. Osmond, Clerk of the West India Committee and it is noteworthy that on the entire consignment there was not a single wasty or bad fruit"....

* * * *

"The King Mandarin oranges which were greatly admired were offered to His Majesty the King who was graciously pleased to accept them."

Extract from letter from George Munro Ltd., Covent Garden, to Sir Algernon Aspinall, Secretary West India Committee.

"I enclose report on the samples of fruit which you submitted to me."

"All the oranges I consider should find a ready market in this country. I have placed them in order of merit as they appeal to me. The "Sylvania" orange is a most luscious fruit and the only drawback that it might become wasty by the time the skin was coloured. The skins of the samples submitted were green, yet the fruit was thoroughly ripe.

In regard to the Grapefruit I consider the "Jamaica" case 19 to be the best and most marketable size. The flavour is good and if it were possible to obtain a strain which would have less pips it would probably be second to none. The seedless sample is very coarse and dry—its only merit is that it is without pips. A seedless grapefruit would meet a real want of the quality ex case 19.

Both samples of lemons are a very fine quality, but it is questionable if we could market these at remunerative prices unless they could arrive in the summer months when Italian lemons are scarce—that is to say from June to October.

The Satsuma Mandarin are excellent and I think these would become very popular indeed marketed from November."

* * * *

"With reference to your request for a report on the two oranges: Boon's Early and Pineapple....we would say that on the whole both these oranges would in a very short time find a very good first class trade, in spite of the lack of good external appearance...."

REPORT ON SAMPLES OF DOMINICA FRUIT.

	Brand or variety.		
ORANGES:			
1.	"Sylvania"	c/s 34.	Very fine flavour, very juicy, good texture, seedless, skin of sample green—it might be difficult to popularise if the fruit had to be marketed this colour.
2.	"Dominica Washington Navel"	c/s 12.	Not quite so luscious as and rather coarse texture but skin silkier and generally more attractive appearance.
3.	"Dominica"	c/s 20.	Fine flavour, juicy but rather tough in texture—skin a good colour.
4.	"Florida"	c/s 31.	Ditto. Ditto.
GRAPEFRUIT.			
1.	"Jamaica"	c/s 19.	Good flavour, juicy and marketable size.
2.	"Jamaica"	c/s 18.	Ditto. Too large for general consumption.
3.	"Sylvania"	c/s 35.	Very fine fruit, but somewhat coarser than above.
4.	"Duncan"	c/s 17.	Good flavour, but coarser in texture.
5.	"Springhill"		Juicy, good flavour, but coarse thick skin.
6.	"Silver Unster"	c/s 16.	Very pithy and dry.
7.	"Marsh's Seedless"		Very coarse, pithy, dry, and thick skinned.
LEMONS:			
1.	"Sicilian"		Very good.
2.	"Villa Franca"		Very good.
MANDARINS.			
1.	"Satsuma"		Very fine luscious fruit and should become very popular, marketed from November.

Extract from letter from Mr. John Moran of Manchester.

* * * *

"I am pleased to say that I have almost cleared my Dominica stock and that it has been very popular. The Dominica oranges are 100 per cent better than Jamaica. The Florida seedling and also the Navel will be the vogue when they can be shipped. The Navels are much above the California Navel—superior in juice and fruit. The more yellow ones are the best. I had two kinds, one very large, but it is the smaller kind which is the best fruit. The Grapefruit are all good excepting the Marsh's seedless which stuck on the skin, but the fruit is all right."

All the fruit forwarded to the Imperial Fruit Show were selected, graded and packed by the staff of the Department and with the exception of the "Sylvania" and "Springhill" brands, were grown in the economic section of the Botanical Gardens. Undoubtedly the exhibits created a very favourable impression on buyers in England, and as a result it is anticipated that Professor Clark Powell, the Citrus Expert of the Transvaal University College, who is to visit various countries on behalf of the Empire Marketing Board, will be able to include Dominica in his itinerary.

The fruit forwarded to the Toronto Exhibition was also highly spoken of and hopes of eventually building up a considerable export trade with Canada are seriously entertained.

Dominica is essentially a fruit growing island being especially suited for citrus culture. Grapefruit grow remarkably well, bear heavily, and possess a first class flavour and appearance. Grapefruit is, however, not an industry for the peasant. I am of opinion that if the possibilities of the industry are to be fully developed, such will be dependent to a large extent on the introduction of the right type of settler with a fair amount of capital or on a large fruit company becoming interested.

Dominica's need at the present is for a Central Packing and Export Depot where all fruit for export can be selected, graded and packed, in the proper manner prescribed by the trade. This with the establishment of an adequate inspection service, and co-operation of producers to assure continuity of supply, will be the means of putting the industry on a sound footing right from its infancy.

The present inspection staff of the Department is doing much good work, but is absolutely inadequate to deal thoroughly with numerous packing houses in town and country. The situation calls for revision and is now receiving consideration.

SUMMARY OF FRUIT SHIPMENTS FROM 1ST JULY, 1927 TO 30TH JUNE, 1928.

Destination.	Limes brls.	Limes c/s.	Mangoes c/s.	Pears c/s.	Oranges c/s.	Grapefruit c/s.	Lemons c/s.	Pineapples c/s.
United States ..	23,644	—	—	104	—	—	—	—
United Kingdom.	—	489	—	—	25	252	—	—
Canada	—	50	2	11	272	118	49	—
Bermuda	—	1,504	2,993	788	505	188	10	46
	23,644	2,043	2,995	903	802	558	59	46

COCONUTS.

The demand on the Department's nurseries for coconut plants continues, and planters especially on the Windward side of the island have planted up considerable areas. All nurseries are continually re-stocked, and the demand for this class of plant is readily met.

A steady increase in the export of copra, has again to be noted. The officlal Export figures for the last four years beginning from 1924 = 46,173 lbs., 1925 = 64,977 lbs., 1926 = 109,037 lbs., 1927 = 140,393 lbs. The export of dried nuts has also increased from 187,794 in 1926 to 236,553 in 1927. This speaks well for the progress this industry is making especially as a considerable number of dried nuts nre purchased by a local soap factory which was established in Roseau during the year.

Cocoa.

Planters whose estates are favourably situated for the growing of this crop are paying particular attention to their existing cultivations and making considerable extensions by new plantings. There is a big demand for planting material which is readily met by the Department.

Coffee.

Increased interest is apparent again, both with the larger planter and peasant proprietor, in returning to this industry, which many years ago was profitable in Dominica. The Congo coffee (*Coffea robusta*) which grows so well in Dominica is the variety principally in demand although Arabian is also being planted in localities where it is apparently best suited. Uganda Coffee, San Ramon, and Exclesa varieties which were introduced by the Department are now being tried on a field scale.

Vanilla.

Despite the low market price, much planting of this crop has been carried out by peasant proprietors.

Nutmegs.

As will be seen from the plant distribution list on another page of this report, a large number of plants have been propagated and distributed. Production is low at present, as only recently have planters become interested

Bay Oil.

During the year under review 9,692 lbs. of Bay Oil were exported, which is slightly less than in the previous year. Low prices ruling during the year were in the main responsible.

Tobacco.

Trial was made with varieties of Tobacco described below on the Department's land on Morne Bruce.

Seed of recommended varieties was obtained from Java, Cuba and Borneo through the agency of the Director of the Royal Botanic Gardens Kew, and grown for comparison side by side with the American varieties Red Tenessee and Kentucky.

Cultural details and treatment.

The site chosen had a western aspect, a level, well-drained piece of land. The soil a clayey loam of good heart and texture. No manure was applied prior to planting, but when the young plants were well established, Sulphate of Ammonia at the rate of 1 oz. per plant was given.

Seed was sown on the 15th September, 1926, and planting out commenced on the 25th November, 1926. Plants were set 2 rows to a bed alternately at 2 feet apart in beds running East to West. The sunny period at the time of planting necessitated a certain amount of shading and watering. Once established the plants grew vigorously.

Excepting for one small attack of Caterpillars calling for measures of control, the general health of the plants was good.

Harvesting commenced on the 8th April, 1927, and it is from the first cutting that the weights of the different varieties were taken.

The average weight of plants weighed immediately after cutting with stem, and the dried tobacco without stem, is as follows:—

Orgin.	Name.	Number of plants weighed.	Average weight of plant green with stem.	Average yield of leaf, Dry.
Seed from Java.	Deli Kedoe, Hybrid, 238 . .	158	1 lb. 6 oz. 2 gr.	3 oz. 5 gr.
	Kedoe, lyn, 100	146	1 ,, 6 ,, 3 ,,	2 ,,
	Kedoe manila	504	1 ,, 11 ,, 12 ,,	2 ,, 15 ,,
	Tjetok	266	2 ,, 6 ,, 4 ,,	4 ,, 3 ,,
North Borneo . .	North Borneo	102	15 ,,	1 ,, 7 ,,
Vilmorin France .	Havana Original	47	10 ,, 3 ,,	1 ,,
America	Red Tenessee	50	2 ,,	3 ,,
Cuba	Var. Havenensis	76	—	1 ,, 4 ,,

Samples of these Tobacco were sent to the Imperial Institute and were reported on as follows :—

IMPERIAL INSTITUTE,

LONDON, S.W. 7.

REPORT ON TOBACCO FROM DOMINICA.

The tobaccos dealt with in this report were received at the Imperial Institute on the 24th August, 1927, from the Agricultural Superintendent, Dominica, and are referred to in his letter No. 589 of 1927.

It was stated that the samples had been grown from seed supplied from the Royal Botanic Gardens, Kew, and that it was desired to ascertain their quality and value.

DESCRIPTION.

The samples, which numbered seventeen, are described in the following table :—

Label.	*Weight.*	*Size of Leaves.* inches	*Colour.*	*Texture.*
No. 1. Tjetok	8 lb. 6 oz.	19 x 8½ to 23 x 12	Variable and poor; medium to dark reddish-brown; some leaves showing greenness, a few badly.	From thin to fair substance but coarse and rough. Lamina weak. Most leaves showed slight burns. Long naked butts and veins wiry. Leaves somewhat broken. Slight mould on butts and along midribs.
No. 2. Tjetok	6 lb. 6 oz.	do.	do.	do.
No. 3. Tjetok	6 lb. 8 oz.	do.	do.	do.

No. 4. Havana Original	4 lb. 4 oz.	10 x 4 to 18 x 11; on the whole small leaves.	Very poor and variable; medium to dark reddish-brown; most leaves showed greenness, some very badly.	Varying from thin to thick, mostly thick: coarse and weak. Some leaves badly spotted with burns and fine holes. Butts well feathered. Many leaves broken, some badly. Veins wiry and prominent. Leaves slightly mouldy.
No. 5. var. North Borneo	4 lb. 2 oz.	12 x 4½ to 23 x 12	Poor, variable colour; light warm brown to dark reddish-brown; many leaves showed greenness, some badly.	Mostly fairly thin, some leaves thick. Generally coarse and rough. Most leaves spotted with holes, some rather badly: a few showed burns. Some leaves badly broken. Butts well feathered. Leaves slightly mouldy.
No. 6. Deli Kedoe Hybrid	5 lb. 6 oz.	17 x 6 to 20 x 14 and 24 x 11½	Light to medium warm brown; some leaves rather orange, a few dark reddish-brown; many showed greenness, a few pronounced.	Fairly thin leaves on the whole; mostly rather rough and lacking in strength. A few with fine holes and burns. Many leaves slightly broken. Butts fairly well feathered. Veins wiry and prominent on the whole.
No. 7. Deli Kedoe Hybrid	8 lb. 3 oz.	16 x 6 to 25 x 14	Light warm to medium reddish-brown; a few leaves dark reddish brown, a few orange and a few showing slight greenness.	On the whole, thin and rather rough. Some leaves of fair strength, but on the whole inclined to weakness. Some with fine holes. A few leaves rather broken. Butts well feathered. Veins wiry and prominent.
No. 8. Deli Kedoe Hybrid	9 lb. 4 oz.	14 x 5½ to 27½ x 13	Light warm brown to dark reddish-brown; a few leaves orange; some showed greenness, a few badly.	On the whole thin and rough; inclined to weakness. Most leaves with fine holes; a few showing burns. Some leaves rather broken. Butts well feathered. Veins wiry and prominent.

No. 9. Red Tennessee	8 lb.	13 x 5 to 27 x 12	Dark reddish-brown, a few leaves showing greenness.	Mostly fairly thick leaves of coarse texture, somewhat lacking in strength. Butts well feathered; midribs rather heavy, veins wiry and prominent. Butts and midribs showed slight mould.
No. 10. Kentucky One Sucker	4 lb. 1 oz.	14 x 3 to 19 x 5 Narrow.	Poor, dark brown colour; some leaves reddish.	Thin leaves, rough, very weak. Veins rather wiry. Butts and midribs slightly mouldy. The sample had a slight musty ammoniacal odour and was obviously fermenting. 2 to 3 inches of the butts were bare.
No. 11. Kedoe Lyn	6 lb.	13½ x 4½ to 26½ x 13	Very poor; light brown to dark reddish-brown; many leaves showed greenness, some badly.	From thin to fairly thick. Rough and weak. A few leaves rather badly torn. Veins wiry and prominent: butts mostly well covered but some bare for 3 to 4 inches. Sample slightly mouldy.
No. 12. Kedoe Lyn.	6 lb. 10 oz.	13 x 4½ to 29 x 13	do.	do.
No. 13. Kedoe Manilla	7 lb. 14 oz.	17 x 6 to 25 x 12	Poor and very variable, light to dark brown or dark reddish or orange brown.	Fairly thin to fairly thick; coarse; some leaves showed slight burns. Midribs rather heavy: veins wiry and prominent. A few leaves badly torn. Butts bare for 4 to 5 inches. Sample slightly mouldy.
No. 14. Kedoe Manilla	7 lb. 7 oz.	do.	do.	do.
No. 15. Kedoe Manilla	10 lb.	do.	do.	do.
No. 16. var. Havanensis	4 lb. 5 oz.	14 x 6 to 20 x 12½	Poor and variable; medium to dark reddish or orange brown; some showed greenness, a few badly.	On the whole, fairly thin: rough: a few leaves showed burns rather badly. A few rather torn. Veins wiry and prominent. Butts bare for 3 to 4 inches. Sample slightly mouldy.

No. 17. Red Tennessee: Dominica prepared black leaf	9 oz.	Up to 24 long.	Dark brown to black.	Somewhat lacking in substance for this class of leaf. Aroma weak and slightly ammoniacal.

The samples were all of poor and variable colour, and the texture was generally coarse and weak. Greenness was very prevalent in most of the samples. The butts in some cases were bare. When exporting tobacco to the United Kingdom such bare stalks should be cut off, in order to save freight and duty.

All the samples on arrival at the Imperial Institute were in too moist a condition and in many cases incipient mouldiness had resulted. Three samples which were representative of the consignment were found to contain from 21 to 26 per cent of moisture when received. This amount is excessive, 12 to 14 per cent being sufficient to maintain the leaf in good order during transit. Buyers in the United Kingdom object to large amounts of moisture as the duty is levied on the total weight, and the price obtainable for such consignments suffers in consequence.

Results of Examination.

Chemical Analysis. Nine typical samples of the tobaccos, viz. Nos. 1, 4, 5, 8, 9, 10, 11, 15 and 16, were submitted to chemical analysis with the results shown in the following table. The figures are calculated for comparative purposes on a uniform basis of 14 per cent of moisture:—

	Moisture. per cent.	*Nicotine.* per cent.	*Nitrogen.* per cent.	*Ash.* per cent.
No. 1. Tjetok	14.0	7.27	3.49	14.7
No. 4. Havana Original	14.0	5.70	3.97	12.9
No. 5. Borneo	14.0	5.55	3.45	14.5
No. 8. Deli Kedoe Hybrid	14.0	7.53	3.53	15.5
No. 9. Red Tennessee	14.0	6.26	3.50	13.6
No. 10. Kentucky One Sucker	14.0	1.93	2.61	14.6
No. 11. Kedoe Lyn	14.0	7.23	3.65	14.3
No. 15. Kedoe Manilla	14.0	6.92	3.97	15.0
No. 16. Havanensis	14.0	7.15	3.12	14 2

The ash from samples No. 1, 8 and 15 was examined in detail and its composition is shown in the following table:—

		Ash, as prepared.			Calculated on CO_2-free ash.		
		No. 1. Tjetok.	No. 8. Deli Kedoe Hybrid.	No. 15. Kedoe Manilla.	No. 1. Tjetok.	No. 8. Deli Kedoe Hybrid.	No. 15. Kedoe Manilla.
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Lime	CaO	37.27	29.11	33.19	44.39	34.64	38.53
Magnesia	MgO	7.25	10.73	7.49	8.64	12.77	8.70
Potash	K_2O	18.99	22.25	22.93	22.62	26.49	26.62
Soda	Na_2O	0.92	1.38	0.68	1.10	1.64	0.79
Sulphates, expressed as sulphuric anhydride	SO_3	6.44	4.71	6.87	7.67	5.61	7.98
Chlorides, expressed as chlorine	Cl	10.21	12.51	8.88	12.16	14.89	10.30
Carbonates, expressed as carbon dioxide	CO_2	16.06	15.98	13.87	—	—	—

The results of the chemical examination of the nine samples of leaf show that the percentage of nitrogen is high and that of nicotine very high in every case except No. 10, in which the nicotine content is unusually low for a leaf of this type. In samples Nos. 1, 8, 11, 15 and 16, the amount of nicotine is abnormally large. High nicotine and nitrogen percentages indicate excessive amounts of nitrogenous matter in the soil, possibly due to manuring, and produce coarseness of flavour.

As regards the composition of the ash, the percentages of sulphates and chlorides (especially the latter) are undesirably high and adversely affect the burning qualities of the leaf. Sulphates and chlorides together should not amount to more than 8 per cent of the CO_2-free ash. The potash content is satisfactorily high, and has to a large extent neutralised the effect on the burning properties of the large amounts of sulphates and chlorides, but it would be advisable if possible to reduce the proportion of these latter constituents in the leaf. The excessive amounts may be due to the use of unsuitable manures, or to the nature of the soil.

Smoking trials. With the exception of No. 10, samples Nos. 1 to 16 were on the whole of similar character, but the series may be divided into the following groups according to their burning qualities :—

A. Nos. 1, 2, 3, 4, 5, 9, 13, 14, 15, 16.

The leaf held fire fairly well, but the smoke had a coarse, strong and pungent flavour, possessing no cigar aroma. The ash was white to grey with a black lip.

B. Nos. 6, 7, 8, 11, 12.

These tobaccos burnt slightly better than those of Series A, probably owing to the leaf being of finer texture. The smoke was lacking in cigar aroma, but the flavour was preferable to that of Series A. In other respects the smoking quality of the leaf was similar to the latter series.

C. No. 10.

This tobacco held fire well, leaving a white to greyish ash with a slight black lip. The sample had better burning qualities than the tobaccos in Series A and B but the flavour, though less raw, was still coarse, pungent and strong.

In view of the raw character of the present samples it would not be safe to draw definite conclusions from these tests as to the relative burning qualities of the different varieties. The examination of a further set of samples, more thoroughly prepared, might give results differing considerably from those recorded above.

Commercial Value.

The samples were submitted to tobacco merchants, brokers and manufacturers, whose reports may be summarised as follows :—

(1) The merchants stated that the tobacco appeared to be very "unfinished" and considered that this might have been due to the quantities available being too small for proper fermentation. They described the leaf as very raw and unpleasant in smoking, and expressed the view that unless the quality could be improved none of the tobaccos represented by the samples would be suitable for use as cigar fillers ; they would also be unsuitable for use as cigar covers, being much too red, dark and uneven in colour. If properly fermented the leaf represented by Nos. 5, 6, 7 and 8 might possibly be employed for cigar bunch purposes, although even from this point of view most of the leaves in the present samples were too thick and coarse.

The firm stated that the cultivation of those different varieties in Dominica had resulted in the production from all of them of tobaccos of very similar character, the only variations observable being the length, and possibly the thickness of the leaf.

(2) The brokers who were consulted considered that the majority of the samples would be suitable for cheap cutting purposes, but that some of them would require butting. No. 5 would be suitable for use in the manufacture of cheap shag, whilst No. 7 might be used as a cigar filler if stripped.

(3) The manufacturers stated that the samples were all more or less of nondescript character and that it was difficult to form a definite opinion on them. The only grade

which appeared to be promising was No. 9 (Red Tennessee) which they considered to have good body and likely to prove useful for pipe tobaccos; the leaf would, however, have to undergo improved handling before it could be considered a commercial proposition in competition with several other Empire growths. The Deli Kedoe Hybrid No. 6 was of mixed character and for the most part thin and spready; it had been considered from a cigar point of view, but the veins would be too thick for the purpose. The firm stated that the remaining types do not call for particular comment except that they are too thin for pipe smoking and too coarse for cigar purposes, whilst the combustion is not satisfactory.

Remarks.

It will be seen from the results of the examination of the present samples (Nos. 1-16) and the reports furnished on them by commercial experts that they are in general of inferior quality. All these samples showed the same general characteristics, and were insufficiently fermented, with the result that the leaf in every case is raw, and the rawness has masked the properties characteristic of the varieties. The colour in general is too dark and reddish, and the texture coarse. The burning properties are fair, but the flavour is in every case strong, coarse and pungent and lacking in cigar aroma. The tobaccos would therefore be unsuitable for cigar manufacture and could only be used (in the condition of the present samples) for cheap smoking mixtures at a low price. It will be realised that it is difficult to assign definite values to tobacco in the condition of the present samples.

The sample of Red Tennessee Black Leaf, No. 17, was of poor quality, with a strong, very pungent, coarse flavour, and lacking in aroma. Of the varieties comprising the present consignment, Red Tennessee No. 9 would appear to be the most suitable for the preparation of black leaf, on account of its substance. In the United States "Kentucky One Sucker" is generally used for this purpose, but it is noteworthy that the sample of this variety included in the present set (No. 10) contains unusually low percentages of nitrogen and nicotine, and has a higher flavour than any of the other samples. In addition the leaf was thin. It would thus appear not so well suited for black leaf as the other samples, but as the present results are unusual, this variety may give different results under further trials.

It is understood that the black leaf is intended for local consumption. As regards the United Kingdom market it is doubtful if black leaf of the quality of the present sample would find any sale. Small quantities of black leaf are imported here from the United States, but they are of much better quality than the present sample, possessing a full flavour and aroma.

It seems desirable that these experiments on tobacco cultivation in Dominica should be continued and that special attention should be paid to the fermentation of the leaf. A further set of samples from a later crop might then be forwarded to the Imperial Institute for examination in continuation of the present enquiry.

20 February, 1928.

CHIEF EXPORTS.

Table of Agricultural Exports for the Triennial Period 1925 to 1927.

	1925.	1925.	1927.
Lime Products:			
Concentrated Juice ...	111,937 galls.	104,014 galls.	106,971 galls.
Raw Juice	313,896 ,,	268,760 ,,	173,848 ,,
Lime Juice Cordial ...	1,741 ,,	2,275 ,,	845 ,,
Distilled oil	35,818 lbs.	33,471 lbs.	31,346 lbs.
Ecuelled oil of limes ...	10,531 ,,	9,381 ,,	7,828 ,,
Citrate of lime	—	—	—
Green Limes	20,218 brls.	21,171 brls.	21,578 brls.
Pickled Limes	293 ,,	536 ,,	263 ,,
Cocoa Products:			
Cocoa	785,669 lbs.	727,034 lbs.	684,550 lbs.
Prepared cocoa	226 ,,	1,149 ,,	139 ,,
Coffee Products:			
Coffee	18,279 lbs.	2,446 lbs.	1,104 lbs.
Coconut Products:			
Coconuts	225,031	187,794	236,553
Copra	64,977 lbs.	109,037 lbs.	140,393 lbs.
Sugar Products:			
Rum	—	26 galls.	544 galls.
Syrup	16 galls.	100 ,,	—
Spices:			
Vanilla	2,112 lbs.	2,537 lbs.	1,226 lbs.
Nutmeg	1,605 ,,	1,543 ,,	459 ,,
Ginger	2,100 ,,	22,914 ,,	9,864 ,,
Honey Products:			
Honey	7,253 lbs.	5,005 lbs.	4,924 lbs.
Bees Wax	460 ,,	30 ,,	238 ,,
Various Products:			
Bananas	13,834 bunches	10,034 bunches	8,828 bunches
Oranges	1,446 brls.	693 brls.	908 brls.
Mangoes	7,925 crates	6,456 crates	4,734 crates
Grapefruit	679 ,,	410 ,,	727 ,,
Pears	1,326 ,,	1,720 ,,	£406 worth
Miscellaneous fruits ...	£48 worth	88 ,,	
Bay Oil	14,283 lbs.	10,745 lbs.	9,692 lbs.
Orange Oil	2,278 ,,	805 ,,	2,638 ,,
Kola Nuts	—	£8 worth	£20 worth
Cassia Fistula	—	£1 ,,	—
Tamarinds	192 brls.	58 brls.	11 brls.
Vegetables	£166 worth	£69 worth	£157 worth
Farine	—	—	£33 ,,
Hides & Skins	893 lbs.	£74 worth	£75 ,,
Leather unmanufactured.	1,053 ,,	1,299 lbs.	1,619 lbs.
Plants, bulbs, seeds ...	£6 worth	£2 worth	£10 worth
Fruits, Jams & Jellies ...	160 lbs.	£337 ,,	£595 ,,
Turtle Shells	423 ,,	271 lbs.	318 lbs.
Baskets	£12 worth	£1 worth	£4 worth
Forests Products:			
Hardwood	80,287 ft.	36,678 ft.	79,575 ft.
Firewood	1,145 cords	605 cords	993 cords
Canoe shells	75	119	53
Shingles	13,600 bundles	13,000 bundles	£3 worth
Charcoal	21,290 lbs.	15,090 lbs.	9,520 lbs.
Locally made boats ...	—	20	£30 worth
Total Values	£125,596	£143,430	£155,806

SUMMARY OF LEGISLATION AFFECTING CROPS.

The first step in the direction of plant protection was taken in 1898 when Act No. 3 was passed to provide against the importation of articles likely to introduce diseases among plants. Under the authority of this act, a Proclamation dated August 27, 1898, prohibited the importation from Ceylon of plants, seeds, berries, earth and soil. This Act was suspended by Law No. 9 of 1904, in which provision is made for the fumigation and disinfection of imported plants, cuttings, buds, grafts, bulbs, roots and seeds, and their packages; also their fruit and vegetables intended for propagation, and not for consumption as food.

Under Law No 6 of 1907 power is conferred to prohibit by proclamation the importation of plants, cuttings, bulbs, roots, seeds or berries, or any earth or soil, or any articles packed therein, or any packages, or other articles or things likely to be the means of introducing any plant disease.

A Proclamation dated February 5, 1909, under No. 6 of 1907, prohibits the importation into Dominica of all plants from Dutch Guiana, which are likely to be the means of introducing disease from that country.

A Proclamation dated October 26, 1910, prohibits the importation of banana plants and suckers from all countries of Central or South America, and from the island of Trinidad, also of coconuts in husk, and all growing plants of coconuts, from Cuba, Jamaica, Trinidad and all countries of Central and South America.

A Proclamation dated October 9, 1916, restricts under certain conditions, the entry of rooted plants, of all kinds from the United States of America, Cuba, Jamaica, Haiti, San Domingo, and Porto Rico.

A Proclamation dated October 26, 1917, prohibits the importation of seed cotton or cotton seed from all countries or places outside the Colony of the Leeward Islands, save and except from some other Presidency of the Colony, or from the Colony of Trinidad and Tobago, and its dependencies or from the Colonies of Grenada, St. Vincent, and St. Lucia, provided, however, that small quantities of cotton seed for experimental purposes may be imported into the Presidency of Dominica, on the written permission of the Superintendent of Agriculture on such terms and conditions as he may prescribe.

A Proclamation dated December 21, 1920, prohibits the importation of sugar-cane from any other country into this Presidency, for the time being.

A Proclamation dated January 28, 1923, prohibits the importation of Johnson Grass (Holcus halepensis) from any other country into this Presidency.

A Proclamation dated January 28, 1923, prohibits the importation of banana plants, (suckers) from all countries except other Leeward Islands, Grenada, St. Vincent, and Barbados.

A Proclamation dated December 24, 1923, prohibits the importation of coconuts and coconut plants from any other country into this Presidency until further orders.

A Proclamation dated May 4, 1925, prohibits the importation of Banana plants (suckers) into this Presidency from all countries except other Leeward Islands, St. Vincent, and Barbados without the written permission of the Governor.

A Proclamation dated July 27, 1925, prohibits the importation of citrus plants from all countries except Windward and Leeward Islands, Trinidad and Tobago, and Barbados. It is, however, allowed that the Curator or Agricultural Officer shall have the power to import for scientific purposes anything thus prohibited, on his making a report of such importation for the information of the Governor.

An Ordinance, No. 23 of 1925, regulates the examination, curing and exportation of Vanilla and also prohibits certain dealings with the same.

An Ordinance dated September 18, 1925, regulates the examination, curing and exportation of Tobacco.

With regard to the export of plants, it is only necessary to state that such cannot be admitted into the United States of America unless accompanied by a certificate showing that they have been inspected by a duly authorized official, and are found free from injurious plant diseases or insect pests.

Ordinance No. 3 of 1926 regulates the Examination and Exportation of fruit likewise prohibiting the shipment of defective fruit.

Ordinance No. 2 of 1927 for the prevention and eradication of Diseases and Pests affecting vegetation provides for (1) the appointment of Inspectors (2) registration and inspection of nurseries.

RAINFALL RETURNS, DOMINICA, 1927.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November	December.	Totals.
1. Bagatelle, Soufrière	4.48	1.91	3.39	5.80	6.04	10.81	8.67	6.04	6.37	8.39	7.85	1.79	71.55
2. Batalie ...	12.04	—	—	—	—	—	—	—	—	—	—	—	—
3. Bellevue ...	12.40	7.29	13.79	12.42	16.61	22.45	21.95	11.28	17.56	16.34	23.78	5.67	181.54
4. Blenheim ...	5.98	6.98	7.66	18.10	10.72	15.43	12.27	8.02	5.27	7.34	19.08	4.88	121.70
5. Botanic Gardens ...	5.50	4.50	5.37	4.67	6.69	15.00	9.61	4.60	6 20	8.84	8.70	1 37	80 95
6. Canefield ...	5.19	3.73	5.64	4.59	4.30	15.91	9.59	6.30	5.62	8.57	9.84	1.69	80.97
7. Castle Bruce ...	12.52	10.63	32.59	50.72	21.39	26.84	21.52	13.81	17.20	14.26	27.80	7.89	297.17
8. Clark Hall ...	8.48	5.77	7.17	8.79	6.52	17.15	14.26	8.34	8.60	12.51	12.02	3.24	112.85
9. Everton ...	7.46	4.48	6.18	6.11	9.07	15.52	10.16	7.92	8.45	7.60	14.43	2.88	100.26
10. Fontaine ...	8.52	5.90	10.56	8.95	12.04	17.90	15.30	8.55	16.28	11.99	16.47	5.10	137.56
11. Goodwill ...	5.59	5.05	5.62	4.57	7.20	15.20	8.64	6.11	6.24	9.48	1.55	11.22	86.47
12. Governor ...	7.07	5.40	14.01	24.87	11.91	16.50	11.96	10.03	10.39	13.68	25.37	8.71	159.90
13. Hampstead ...	4.43	3.97	6.98	18.54	11.03	13.66	8.18	5.70	4.56	7.53	15.32	5.26	105.16
14. Hillsborough ...	5.66	4.49	7.99	6.98	4.70	16.43	11.09	6.59	6.29	9.93	10.52	2.36	93.05
15. Londonderry ...	3.22	4.16	20.89	10.13	6.14	11.13	7.06	7.83	7.16	11.57	22.57	4.31	116 10
16. Moore Park ...	7.35	6.72	11.06	18.41	9.46	19.48	11.46	7.10	5.31	8.06	10.05	3.30	117.16
17. Morne Bruce ...	6.79	5.07	6.70	5.18	7.50	16.05	10.67	4.95	7.18	8.79	9.47	1.80	90.18
18. Picard ...	8.17	6.51	9.81	8.89	6.45	16.25	11.67	7.85	7.56	8.31	13.48	4.58	109.53
19. Pte. Mulâtre ...	4.50	3.27	16.40	21.72	7.79	13.45	10.37	6.70	12.06	11.13	24.38	3.74	135.51
20. Rosalie ...	4.70	4.31	18.09	29.14	11.35	12.94	14.04	5.24	16.37	14.02	33.12	7.36	170 68
21. Shawford ...	21.64	13.61	17.93	19.12	18.74	32.73	21.72	13.07	9.66	18.18	29.30	10.02	219.62
22. Sherwood ...	14.32	3.72	23.14	16.61	14.21	29.60	20.94	12.03	13.16	17.98	25.45	7.45	198.61
23. Soufrière ...	5.22	3.00	7.74	7.31	8.04	11.56	8.60	6.20	6.01	9.16	10.24	1.83	81.91
24. Stowe ...	7.24	3.41	10.00	13.95	13.75	13.10	12.28	7.52	11.32	11.00	17.37	6.55	127.49

Mean Rainfall 24 Stations ... ... 125.90 inches.
,, ,, 10 Leeward Stations... ... 91.77 ,,
,, ,, 5 Windward ... ... 96.80 ,,
,, ,, 4 Inland ... ... 184.23 ,,
,, ,, 4 Lasoye ... ... 125.71 ,,

METEOROLOGICAL REGISTER KEPT AT BOTANIC GARDENS, DOMINICA.

1927. Months.	Thermometer. Dry. 9 a.m.	Dry. 3 p.m.	Wet. 9 a.m.	Wet. 3 p.m.	Relative Humidity. 9 a.m.	Relative Humidity. 3 p.m	Thermometer. Max'm.	Thermometer. Min'm.	Barometer Corrected. *Reduced to 32° Fh. Sea Level.* 9 a.m.	Barometer Corrected. *Reduced to 32° Fh. Sea Level.* 3 p.m.	Rainfall.	Barometer Corrected. Highest.	Barometer Corrected. Lowest.	Thermometer. Highest. Max.	Thermometer. Lowest. Min.	Remarks.
January ...	75.1	78.2	70 4	70.8	76.2	66.1	83.3	68.4	30.40	29.92	5.50	30.08	29.87	89	64	
February ..	76 3	79.4	69.0	69.9	67.3	58.8	86.7	67.1	30.04	29.96	4 50	30.13	29.92	89	65	
March ...	80.1	86.0	71.5	71.7	64.1	58.5	87.5	68.4	30.01	29.46	5.37	30.05	29 91	90	64	
April ...	80.7	81.0	72.7	72.8	64.5	63.4	82.0	70.7	29.90	29.87	4.67	30.02	29.81	92	67	
May ...	82.7	82.0	73.6	73.3	63.8	60.0	90.2	71.2	30.00	29.94	6.69	30.06	29.90	94	68	
June ...	73.2	83.0	75.6	74.3	66.9	57.7	90.3	71.3	30.29	29.97	15.03	30.05	29.90	92	70	Thunder storms during nights of the 11th, 12th & 13th and the morning of the 14th.
July ...	84.4	83.6	76.3	76.1	62.7	62.6	90.8	70.5	30.01	29.98	9.61	30.09	29.91	93	70	
August ...	82.2	83 5	86.3	81.2	88.5	78.7	92.1	71.6	29.97	29.82	4.65	30.02	29.89	95	71	
September.	85.1	84.4	75.0	76.6	73.2	69.0	93.7	73.0	29.91	29.84	6.20	29.96	29.81	94	72	
October ...	81.9	83.2	75.7	77.0	72.0	70.9	93.0	71.4	29.90	29.83	8.84	29.98	29.69	94	69	Thunder storms on the 7th and from the 10th to the 15th and again from the 17th and the 25th.
November.	80.6	81.2	75.1	74 8	74.7	70.0	87.2	72.2	29.90	29.88	8.70	29.98	29.77	91	69	
December .	78.4	80.7	72.5	72.6	71.6	64.7	86.2	70.0	29.93	29.85	1.37	29 98	29.71	90	65	
	80.0	82.1	74.4	74.2	72.1	65.0	88.5	70.4	30.02	29.86	66.54					

Highest Maximum Temperature = 94° on August 22nd. Lowest Minimum Temperature = 64° on January 7th.
Highest Barometer (Corrected) = 30.13 on February 15th. Lowest Barometer (Corrected) = 29.69 on October 15th.
Greatest Rainfall in 24 hours = 4.80 inches on May 22nd.

RAINFALL AT THE BOTANIC STATION, DOMINICA, 1908-1927.

Month.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916	1917.	1918	1919	1920.	1921	1922	1923.	1924	1925.	1926	1927.	Monthly Mean Rainfall.
January ...	1·56	2·30	5 20	11·46	8 21	7·43	3·22	1·76	10 79	5 00	6 02	2 42	7 54	6 82	6 50	3 82	6·25	7·88	3 68	5 50	5 53
February ..	1·16	5·02	11·42	4·00	1 32	2 32	5 56	1·04	1·90	4·10	8 73	1·52	4 76	1·02	4 30	2 30	1 90	1 95	2 46	4 50	3 51
March ...	3·68	2·08	1·16	3·11	4·60	7 29	2·23	0 84	4 52	6 74	3·32	0 69	3·80	4·46	2·80	3 46	0 66	3 50	·96	5 37	3 54
April ...	3 08	8·12	2 86	5·00	3·38	1·57	6·45	15·75	1 22	0·47	1·86	2 36	·22	3 06	2 26	3 77	1·46	·40	2 77	4 67	3 44
May ...	2·24	1·92	7·30	11·16	1·56	3 46	2·58	3·65	2 05	2 94	5 90	4·60	2 38	1 54	2 64	0 13	3 18	2 76	2 44	6 69	3·43
June ...	6·16	9 00	14 26	6 54	5 44	3·49	7·27	9·17	4 82	15 31	6 04	3·88	3 48	1·96	7 14	4 18	4 42	5 80	5 76	15 03	7 10
July ...	9 22	9 86	12·60	8 08	5 83	7 57	11·83	14 84	8·23	13 70	11 28	12 64	12 08	11 18	6·08	8 20	13 64	6 23	10 14	9 61	9 95
August ...	9 41	13 12	10·22	11·43	4·88	10 93	3 98	14 74	16 58	8 53	8 46	9 64	8 76	9 30	9 26	11·44	11·28	13 88	10·10	4 65	9 78
September.	7.52	6 44	8 90	15·34	3·32	8·39	7 71	11·36	6 20	15·02	4·14	7 06	8·60	6 28	10 68	4 28	4 88	9 12	4 12	6 20	8 93
October ...	5 12	13.10	3 82	7 06	7·26	10 40	5·13	8·41	10 06	2·46	6 67	7 50	12 60	9 41	2 68	9 84	10 98	12 55	5 86	8 84	7 95
November.	1·96	4 36	5·40	6 91	11 20	4 28	9 44	10 05	14 28	1 92	3 36	9 02	4 62	2 44	3·00	1 06	6 86	9 60	7 54	8 70	6 43
December..	7 80	5·82	7·50	7·14	6 66	2 72	9·70	8·40	3 77	4 58	5 86	6 70	5 62	4·22	6 90	1 92	13 65	2 02	3 75	1 37	6 29
Total ...	58 91	81·44	90·64	97 26	63·72	69 70	75 10	100·01	83·42	80 80	71 46	68 03	74 46	61 72	64 24	54·40	79·16	75 69	59 58	81 31	75 88

Average year = 74 55 inches.

APPENDIX I.

PEASANTS' INFORMATION BUREAU.

SIR,

I beg to submit the following Report on the work of the Peasants' Information Bureau for the financial year 1927/1928 :—

2. I attach (a) Balance Sheet at 31st March, 1928. (b) Profit & Loss Account for the financial year (c) Statement showing the quantity of produce dealt with from 1st April, 1927 to 31st March, 1928. The receipts during the period amounted to £963. 2. 4 and the payments to £1,025. 5. 0. The difference being represented by floating balances.

3. It will be apparent from these statements that the volume of business transacted has been small and that expansion has not been as rapid as could have been hoped. This is partly to be accounted for by the very short crops both of Cocoa and Limes which were reaped during last season, and partly to causes to which I referred in my last report, namely that the peasants are to a large extent tied to their existing local business connections. Evidences are not wanting however that this factor is slowly yielding, and recently I have had several people doing business for the first time with the Bureau who had previously transacted their business through other channels. The peasants continue to express great appreciation of the work of the Bureau, and it is significant that, having once established the connection, they almost invariably continue to do their business through the Bureau. There has, I think, been only one exception to this. Sometimes owing to inactive markets and the very poor quality of peasants' produce generally, the produce has remained on the market unrealized for a considerable time, and this has given rise to some dissatisfaction, but such delays, which are not of frequent occurrence, are quite unavoidable.

4. Lately I have had many small consignments of limes, both green and ripe, sent in from the Marigot district, and there has been no difficulty in disposing of these at very satisfactory prices. This is the first time that the people residing in that distant part of the island have been able to participate in this highly remunerative business, and it is solely owing to the inauguration of the Motor-schooner service and the assistance of the Peasants' Information Bureau that they have been able to do so. In the absence of either of these agencies the business could not be transacted.

5. One of the factors which presents very great difficulty is the high rates of freight from the Windward Coast to Roseau. Owing to this the people in the neighbourhood of Marigot who are very keen on making use of the Bureau, are debarred from sending in such things as charcoal, bananas, etc. which they produce in quantity but which do not realize sufficient in the local market to leave any profit after providing for the high cost of transport. I have discussed this matter with the Agent of the Coasting Schooner *Mermaid C* and I understand that it is his intention to submit a revised schedule of freight rates for the approval of the Government.

6. I have been making efforts to develop a business in hardwood for which there is a good demand in Antigua and St. Kitts but here again I have encountered the same difficulty, viz. the very heavy charges for freight and boatage, and for handling the lumber three times i.e. once at the port of shipment and twice in Roseau. I am endeavouring to overcome this by arranging for orders sufficiently large to justify the sending of a sloop to the port of shipment which will take the lumber direct to its destination. If this can be done a remunerative business can be developed which will provide employment for some of these who at present find it difficult to make a living.

7. *Farine.* In the month of December farine is produced in quantities larger than the local market can absorb, and as the producers are at that time all keen to effect sales so as to provide funds for the Christmas festivities, prices were wont to fall to an unremunerative level. During the 1927 season the Bureau was able to control the situation by buying up all the farine offering at a fair price and releasing it during the early months of the following year. Last Christmas however the surplus was exported, a market having been found for it in Bermuda. I am informed that hitherto only at Christmas time has there been any demand for farine in Bermuda, which fortunately synchronises with our period of maximum production. It would appear however that the demand for this article in Bermuda is growing, as recently several small shipments have been made to that Colony

by some of the local traders, and it looks as though a business in this product is gradually being built up.

8. *Arrowroot & Tous-les-Mois.* The result of efforts to deal with these products in the hope of fostering an extension of their cultivation have been very disappointing. The bulk of the Arrowroot bought last year was shipped to London and the hope was expressed in my last report that a substantial profit would be shown on the transaction. That hope has not been realized. After being on the market for about 12 months the arrowroot was sold at 1¾d. per lb. which was ¼d. per lb. below the price at which it was purchased from the peasants. I am convinced that Messrs. Gillespie Bros. & Co. Ltd., to whom the produce was consigned did all they could to realize a better price and that their failure to do so was due solely to the fact that the arrowroot though of good quality, was not in the form to which the London market is accustomed. Messrs. Gillespie reported that they had "done everything to interest buyers, but unfortunately the arrowroot was so dry and lumpy that anybody who bought it would have to go to considerable expense in breaking it up, and we may say that it was only after considerable difficulty and persistent refusal of still lower bids that we were able to make the sale at 1¾d. per lb." and they add "We would suggest the use of moderately fine metal sieve to produce arrowroot of suitable appearance, which should be used before the lumps become too hard in the process of drying."

9. As I pointed out in my last report for the year 1926/1927 the arrowroot industry is confined to a small section of the island, but it is one which is well worth fostering, and it would be of greatest benefit to the peasantry in this section if the Agricultural Department would take the matter in hand and instruct the people in the proper methods of preparing a marketable product. Tous les Mois continues to be disposed of very slowly, no market having yet been found in which the product can be sold in any quantity.

10. *Grape fruit.* Three shipments of grape fruit aggregating 158 crates were made to London and 4 crates were shipped to Halifax, all with highly satisfactory results.

11. *Lemons & Shaddocks.* In order to test the market value of locally grown lemons and shaddocks two shipments aggregating 34 crates of the former and 1 crate of the latter were made to Halifax. The lemons were of the Messina and Villa Franca varieties. They realized a uniform price of $3.75 per crate and the consignees Messrs. John Tobin & Co. of Halifax reported as follows:—

"Our trade seems to be well satisfied with the quality of the lemons as far as value is concerned, but do not take kindly to their rough appearance, preferring the smooth skin of the European fruit. If you are unable to supply fruit of this description it may be possible for us on account of otherwise choice quality of Dominica Lemons to get some of our best retail trade interested in the handling of same."

12. The price realized, though far below the then current price of Sicilian or Californian Lemons in Canadian markets, is sufficient to leave a large margin of profit, and it is worth considering whether, in view of the marked resistance of the lemon to "withertip" and the excellent quality of the locally grown fruit, it would not be worth while to encourage the extension of lemon cultivation in suitable areas, and meanwhile to conduct manurial experiments with the object of improving the quality of the skin. With regard to Shaddocks Messrs. Tobin & Co. reported that "there is no demand for this class of fruit."

13. *Green Vegetables.* On the suggestion of His Honour the Administrator the question of organizing the growing of vegetables e.g., cabbages, carrots and turnips &c. for export has been taken up. As a preliminary step the requirements of the various intercolonial markets are being canvassed, and the selection of suitable agents is also receiving attention. It is also hoped to supply the Canadian Government Steamers and the Steamers of Messrs. Furness Withy & Co. with their supplies of green vegetables for the round trip. As soon as the preliminaries have been settled the various parties interested will be called together and a definite scheme formulated. Financial assistance and careful Co-ordination of effort are both essential if the business is to have a chance of success, but I have very great hope that if the Loan Board can see its way to finance the scheme, the other difficulties will be overcome, and a successful industry developed.

14. *Manure.* During the year a small stock of Fish Manure was maintained. This has all been sold and at a fraction over cost price and a further lot is on order and is expected shortly. This Manure, of which I have personal experience, has given excellent results

wherever it has been tried and its use, I feel sure; will be greatly to the peasants' advantage.

15. In addition to making shipment and arranging for the sale of produce locally it has been my constant endeavour to assist the peasants in any possible way and I am left in no doubt that my efforts have met with considerable appreciation.

16. Market Reports continue to be issued weekly and interested parties are encouraged to telephone for latest information as to prices whenever they desire to do so. This facility is made use of to a considerable extent. I am of opinion that this branch of the Bureau's work has been of incalculable value in protecting the peasants in their direct dealings with the traders in the various local centres.

I have the honour to be,

Sir,

Your Obedient Servant,

J. C. MACINTYRE,
Peasants' Adviser.

The Honourable
F. G. Harcourt,
Agricultural Superintendent.

STATEMENT OF PRODUCE PURCHASED & SOLD OR RECEIVED FOR SHIPMENT FOR PEASANTS, BY THE PEASANTS' INFORMATION BUREAU.
1st July, 1926 to 31st January, 1928.

Products.	*Quantity.*	*Actual or estimated value to nearest pound.*
Concentrated Lime Juice . .	Casks 46½	462 0 0
Raw Lime Juice	,, 3	5 0 0
Lime Oil	Lbs. 42	45 0 0
Bay Oil	,, 195½	39 0 0
Cocoa	Bags 62½	335 0 0
Arrowroot	Lbs. 9,235	115 0 0
Tous les Mois	,, 5,711	36 0 0
Farine	Pots. 2,233	77 0 0
Starch	,, 7	0 5 0
Rubber	Lbs. 1,239	75 0 0
Ginger	Bags 18½	25 0 0
Nutmegs	Lbs. 3	12 0 0
Coffee	,, 128	6 0 0
Coconuts	Bags. 54	15 0 0
Coconut Fibre	Bales 4	5 0 0
Corn	Pots. 405	9 0 0
Syrup	Tins 19	4 12 0
Charcoal	Bags 22	2 15 0
Honey	Galls. 176	23 0 0
Wax	Lbs. 30	1 3 0
Vanillas cured	,, 40½	8 0 0
Tobacco	,, 39	2 0 0
Turtle Shell	,, 4½	5 9 0
Cattle Yokes Hardwwood	Pcs. 150	2 0 0
Plantains & Bananas	Bunch. 47	6 0 0
Grapefruit	Fruit 22,698	90 0 0
Oranges	,, 7,698	16 0 0
Lemons	Crates 48	27 0 0
Limes	,, 58	18 0 0
Mangoes	Fruit 1,000	2 0 0
Pears	,, 2,673	10 0 0
		£1,479 4 0

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